



**Fourth
Edition**



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UGC
NET/JRF/SET
PAPER-1

**As per Updated Syllabus
Applicable From June,
2019 Onwards**

SESSION
2022

**Teaching
& Research
Aptitude**
General Paper- 1

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PREFACE

I am glad indeed to place this title NTA NET/SET PAPER 1ST (**FORTH EDITION**) in the hands of those students who are preparing for NTA exam.

This book is written strictly according to the prescribed syllabus. In preparing this book, I have freely drawn the material both from the books of Indian & foreign authors.

The book is divided into **10 units**.

I request every teacher and the taught to bring such mistakes to the notice of the author so that they can be redressed in the next edition.

I welcome every constructive suggestion that goes in improving the quality of the work and the utility of the book.

2022

Srinagar-J&K

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BASED ON NEW SYLLABUS

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UNIT-1

TEACHING APTITUDES

EDUCATION

The terms education, teaching and learning are closely related. The objective of education is learning. Education is the key to everything that is good in our world today. Education is not only about the past & present, but it is also the key to the future. Education not only teaches our children facts but also teaches them how to think and learn on their own.

According to Swami Vivekananda 'education as the manifestation of perfection already in man'.

Major Philosophies & approaches in Education

1. **Idealism:** the word 'idealism' has been derived from 'ideal'. It is basically about mind and self, that is actually spiritualism. The universal mind or God is central in understanding the world. God is the source of all creation and knowledge, spirit and mind constitute reality. **Values are absolute, eternal and unchanging. Real knowledge is perceived in mind that is more important than knowledge gained through the senses.**
2. **Naturalism:** naturalism is a philosophy with the belief that nature alone represents the entire reality. Human life is a part of nature; it is a self-sufficient entity having its own natural matter, natural force and natural laws. Our senses are the gateway to knowledge and nature is the source of all knowledge. **The main protagonists of naturalism are Tagore, Rousseau and Herbert.**
3. **Pragmatism:** pragmatism literally means **action or practice**. Here, the key word is utility, whatever is useful is good and whatever is good is useful. A pragmatist lives in a world of facts. Pragmatism focuses on activity or doing. There are no absolute values of life. Truth is created during the course of experience. Humans are active beings and have the ability to solve their problems through the logic of experiments and scientific methods.
4. **Constructivism:** the learner actively constructs knowledge. **Jean Piaget** believed that learning involves an active processing of information and that each individual activity organizes and constructs knowledge for itself. Educational psychology believes that there are developmental stages for knowledge organization.
5. **Humanism:** **it is a reasonable balance in life and regards humans as the Centre and measure of all activities.** Humanism believes in the interests and welfare of all human beings.
6. **Rationalism:** rationalists claims that there are significant ways in which our concepts and knowledge are gained independently of sense experience.
7. **Empiricists:** empiricists claims that sense experience is the ultimate source of all our concepts and knowledge.
8. **Existentialism:** **existentialism is the philosophy that emphasizes individual existence, freedom and choice.** This emphasizes the uniqueness and isolation of the individual experience in a hostile or in different universe, regards human existence as unexplainable and stresses freedom of choice.
9. **Behaviourism:** This assumes that learner is a passive organism who may be conditioned to learn new behaviors. Therefore, learning could be explained by change in observable behavior. E.L. Thorndike postulated the law of exercise and the law of effect.
 - (a) **Law of exercise:** Repeating a conditioned response would strengthen the bond between the stimulus and the response. In other words, practice makes a man perfect.
 - (b) **Law of effect:** Law of effect is the principle of reinforcement and punishment. Any behavior followed by pleasure would strengthen the behavior and any behavior followed by pain would decrease the behavior.

Important concepts in education & its Proponents

1. Basic education (Waradha education system) : Mahatma Gandhi
2. Learning to take place in nature and from nature: Rabindranath Tagore
3. Integral education: Sri Aurobindo
4. Focus on spiritual aspects of Indian philosophy: Dr. Sarvepalli Radhakrishnan
5. Education to transform human mind: J. Krishnamurti
6. Experiential learning: John Dewey
7. Self-education through development of individuality: Maria Montessori
8. Kindergarten—focus on self-activity, creativeness, and social cooperation: Froebel
9. No formal learning— nature is the only teacher: Rousseau

CONCEPT OF TEACHING

Teaching is a process which usually takes place in the class room situations. It is more of formal processes. In the class room situations we see that the teacher has something in his mind and he wants to convey it to the students. For this purpose, he takes the help of teaching. He makes all efforts to make the students understand it. His teaching is successful if the students are able to grasp it fully.

NEED OF TEACHING:

Through teaching, the teacher aims at:

- ✚ Giving some knowledge to the students;
- ✚ Passing some information to them;
- ✚ Making the students acquire some skill;
- ✚ Changing the attitude of the learners;
- ✚ Modifying the behavior of the students;
- ✚ Giving some experiences of life; etc.,

Teaching in the class depends upon how the teacher performs his duty of **teaching**. A sincere and hardworking teacher always comes out all successful. He makes every effort to achieve the desired ends. He always goes well prepared in every way. In his class room teaching, there is always a very good class room interaction. He faces the class clearly and boldly. He is always facing to case with the students while speaking in the class. Naturally, that type of teacher will be able to impress the students fully. Such a teaching can be called effective teaching.

Teaching may also take place outside the **class rooms**. The students come in contact with their teacher in the corridors, in the staff room, in the canteen, in the playgrounds; in the school assemble grounds etc., the process of teaching surely goes on there also which is more of informal type. Learning by the students through informal contacts with the teacher is many a time more sound and lasts longer.

In fact, **teaching** is an art of educating other people. In this age of science and technology when there is explosion of knowledge, the process of teaching has reached new dimensions. It is no longer a simple art of imparting information to the students. It is now tending to become a technology by itself instructional television, computer assisted instruction, teaching machines, etc.

Teaching is an activity which goes on between the two parties i.e. the giver and the receiver. Here the giver is the teacher more matured person with more experiences of life. The receiver may be an individual, a small group or a big group. Teaching is not a mechanical process. It is an intricate, exacting, challenging job. Teaching can't be boiled down to a convenient formula of "telling and testing". It is the complex art of guiding pupils through a variety of selected experiences towards the attainment of a widening field of learning.

The Aim of Teaching:

- ✚ The aims of teaching with respect to its various modes, are as follows Teaching – To bring changes in the behavior of students.
- ✚ Conditioning – To improve the learning skills of students.
- ✚ Training – Shaping the behavior and conduct.
- ✚ Instruction – Acquisition of knowledge.
- ✚ Indoctrination – Formation of belief.

Objectives of Teaching:

Major objectives of teaching are as follows:

- ✚ To bring desired changes in pupils.
- ✚ To shape behavior and conduct.
- ✚ Acquisition of knowledge
- ✚ To improve the learning skills of students.
- ✚ Formation of belief.
- ✚ To provide a social and efficient member to the society.

BASIC TEACHING MODELS

1. **PEDAGOGY MODEL:** Pedagogy is a **conventional approach**. In this method, the instructor, more or less, controls the material to be learned and the pace of learning while presenting the course content to the students. **The purpose of this method of learning is to acquire and memorize new knowledge or learn new skills.** Instructor centered teaching can also be described as pedagogical approach. Pedagogy is the art and science of teaching. It determines how the teaching occurs, the approach to teaching and learning, the way the content is delivered and what the students learn as a result of the process. **In pedagogical approach,** the learner is dependent upon the instructor for all learning and the teacher assumes full responsibility for what is taught and how it is learned.
2. **ANDRAGOGICAL MODEL:** in this model, the learner is mostly **self-directed** and is **responsible for his or her own learning**. The students learn best not only by receiving knowledge but also by interpreting it that is learning through discovery and at the same time, setting the pace of their own learning. **In this method,** the instructors facilitate the learning of participants and help them by offering opportunities to learn themselves and acquire new knowledge and develop new skills. This type of teaching is also referred to as andragogical approach.

LEVELS OF TEACHING

We all know that teaching is a purposeful activity. Through teaching the teacher brings a desirable change in the learner. Both the concepts teaching and learning are interrelated to each other. Development of all-round personality of the learner is the final goal of teaching and learning. During teaching an interaction takes place between an experienced person (teacher) and an inexperienced person (student). Here the main aim is to bring change in the behavior of the student.

Teachers teach students at **three levels**. They have to keep in mind about the developmental stage of the learners so that desired educational objectives can be achieved. These three levels are:

- ❖ **Memory level: Thoughtless teaching**
- ❖ **Understanding level: Thoughtful teaching**
- ❖ **Reflective level: Upper thoughtful level**

Memory level of teaching

It is the first and thoughtless level of teaching. It is concerned with memory or mental ability that exists in all living beings. Teaching at memory level is considered to be the lowest level of teaching. At this level:

- ❖ **The thinking ability does not play any role.**
- ❖ **Students only cram the facts, information, formulas and laws that are taught to them.**
- ❖ **The teaching is nothing but learning the subject matter by rote**
- ❖ **The role of the teacher is prominent and that of the student is secondary.**

The study material is organized and pre-planned. The teacher presents the study material in a sequential order.

Memory level teaching lacks insight. Psychologically, **it is cognitive level teaching.**

Merits of memory level teaching

- ❖ Useful for children at lower classes. This is because of their intellect is under development and they have a rote memory.
- ❖ The role of the teacher is important in this level of teaching and he is free to make choices of subject matter, plan it and can present it at will.
- ❖ The knowledge acquired at memory level teaching forms a basis for the future i.e. when student's intelligence and thinking is required.
- ❖ Memory level teaching acts as the first step for understanding and reflective levels of teaching. It is pre-requisite for understanding level teaching.

Demerits of memory level teaching

- ❖ This does not contribute to the development of the student's capabilities.
- ❖ Since at this level student learns by rote, the knowledge gained does not prove helpful in real life situations as it does not develop the talents of students.
- ❖ The pupils are kept in strict discipline and cramming is insisted on this teaching.
- ❖ Intelligence does not carry any importance in this type of teaching and it lacks motivation

Understanding level

Understanding something is to perceive the meaning, grasp the idea and comprehend the meaning. In the field of Education and Psychology, the meaning of 'understanding' can be classified as:

- ❖ **seeing the total use of facts**
- ❖ **seeing relationship**
- ❖ **a generalized insight**

The teaching at the understanding level is of a higher quality than the one at the memory level. It is more useful and thoughtful from the point of view of mental capabilities. At this level of teaching, the teacher explains the student about the relationship between principles and facts and teach them how these principles can be applied. Memory level teaching barrier is essential to be crossed for this level of teaching.

As compared to **memory level teaching**, the understanding level teaching has greater merit. This enables students to have complete command over subject material. In the understanding level role of the teacher is more active. The students at this level are second any. At this level, no cramming is encouraged. The new knowledge acquired at this level is related to the earlier knowledge gained. A generalization is made on the basis of facts and the facts are used in the new situations.

Merits of the understanding level of teaching:

- ❖ **At this level of teaching students to make use of their thinking abilities.**

- ❖ Knowledge acquired at this level forms the basis of the reflective level of teaching.
- ❖ Here the teacher presents subject matter before the students in an organized and sequential form. The new knowledge acquired is related to the previously acquired knowledge.
- ❖ Here the students do not learn by rote. Here they learn by understanding the facts and information and their use and purpose.

Demerits of the understanding level of teaching

- ❖ Teaching at this level is subject centered. There is no interaction between the teacher and students at this level.
- ❖ This type of teaching mastery is emphasized.

Reflective level of teaching

This level is also known as **introspective level**. Reflecting on something means giving careful thought to something over a period of time. It also means thinking deeply about something.

Reflective level of teaching is considered to be the highest level at which teaching is carried out.

- ❖ It is highly thoughtful and useful.
- ❖ A student can attain this level only after going through memory level and understanding level.
- ❖ Teaching at the reflective level enables the students to solve the real problems of life.
- ❖ At this level, the student is made to face a real problematic situation. The student by understanding the situation and using his critical abilities succeeds in solving the problem.
- ❖ At this level emphasis is laid on identifying the problem, defining it and finding a solution to it. The student's original thinking and creative abilities develop at this level.
- ❖ The role of the teacher in this level of teaching is democratic. He does not force knowledge on the students but develops in their talents and capabilities.
- ❖ The role of the students is quite active.
- ❖ Reflective level of teaching is that which is problem-centered and the student is busy in original imagination.

Merits of reflective level teaching

- ❖ The teaching at this level is not teacher-centered or subject-centered, it is learner-centered.
- ❖ There is an interaction between the teacher and the taught at the reflective level teaching.
- ❖ At this level, teaching is appropriate for the higher class.
- ❖ At this level, teaching is highly thoughtful and useful than the teaching at the memory or understanding level.

Demerits of reflective level teaching

- ❖ Not suitable for small children at the lower level of teaching. It is suitable only for mentally matured children
- ❖ At this level, the study material is neither organized nor pre-planned. Therefore students cannot acquire systematic and organized knowledge of their study courses.

Nature and characteristics of teaching

1. The main character of teaching is to provide guidance and training.
2. Teaching is an interaction between teacher and students.
3. Teaching is an art to giving knowledge to students with effective way.

4. Teaching is a science to educate fact and causes of different topics of different subjects.
5. Teaching is continuing process.
7. Teaching is formal as well as informal
8. Teaching is communication of information to students. In teaching, teacher imparts information in an interesting way so that students can easily understand the information.

POINTS TO REMEMBER

Instruction: It is delivery of contents by the teacher. It does not involve an interaction between the teacher and the learner; but still it facilitates achievement of teaching objectives. Teaching is a wider concept and instruction is a part of teaching.

Indoctrination: Indoctrination can be termed as the highest order of teaching. In indoctrination, the beliefs and ideas are impressed upon others and can be included in teaching. Teaching can be done without indoctrination but no indoctrination is possible without teaching.

Microteaching: is a teacher training technique for learning teaching skills. It employs real teaching situation for developing teaching skills and helps to get deeper knowledge regarding the art of teaching. This Stanford technique involves the steps of 'plan, teach, observe, re-plan, re-teach, and re-observe'. Most of the pre-service teacher education programs widely use microteaching, and it is a proven method to attain gross improvement in the instructional experiences. Effective student teaching should be the prime quality of a teacher. As an innovative method of equipping teachers to be effective, skills and practices of microteaching have been implemented.

Learner's characteristics

Learner's characteristics are many such as personal, academic, social/emotional and/or cognitive in nature.

Personal characteristics can be defined as demographic information about the learner such as age, gender, cultural background, maturation, language, social economic status and specific needs of a learner group such as particular skills and disabilities for and/or impairments to learning.

Academics characteristics of respondents including the education type, education level, and knowledge. The learner has social/emotional characteristics.

Cognitive characteristics of learner can be described such as memory, mental pressure, solve problems, intellectual skill, remembers, organizes and store information in the brain.

Learner's characteristics-

During a learning phase, a learner faces different issues such as doubts, fear of exam, exam pattern, study material and syllabus etc. These problems can be tackled through hard work, consistent efforts and more practice.

There are the few characteristics of learners given below-

Good learners are curious: A learner is never satisfied. They are always hungry for information, love the discovery and try to find out the solution to problems.

Carefully understanding: A good learner possesses the attribute of careful understanding. Most of the knowledge can be gained with the hard work and efforts. A learner should try to understand the subject matter carefully. An effective learner always tries to interpret the stimulus, combine and differentiate them and give them some meaning.

Willingness to learn- A Learner is always willing to learn and open for information. He has a broad mental space and accepts the changes consistently. Inquisitive nature of learner develops an urge in them for acquiring more and more knowledge from their parents, siblings, neighbours, relatives, teachers, society and many more.

Interests and attitude of learner: There is a difference between the interest and the attitude of learner. A teacher always plays an important role to assess the learners for their interest and aptitude so that they can guide according to their aptitude.

Easily Adjustment to Change- Although, it is not possible to every learner to adjust in every situation as a different learner has different characteristics of adjustment. Some learner easily adapts classroom environment and some feel uncomfortable in the class environment. So, a good learner should adjust according to the situation.

Internal Motivation- Motivation is an important factor for a learner to achieve their goals. Learners differ in their capacity of motivation. Some learners are easily motivated while some feel hesitation for a long time before they get motivated by their instructors.

Bloom's classification of Teaching and Instructional objectives

According to this classification, instructional objectives fall under one of the following three categories:

1. Cognitive domain: The cognitive domain involves knowledge and the development of intellectual skills (Bloom, 1956). This includes the recall or recognition of specific facts, procedural patterns, and concepts that serve in the development of intellectual abilities and skills. It functions at six levels, which are as follows:

(a) **Knowledge:** It is basically about recalling information or contents.

(b) **Comprehension:** It is the ability to grasp the meaning of a material.

(c) **Application:** It converts abstract knowledge into practice.

(d) **Analysis:** It involves breaking down a communication into its constituent parts in such a manner that relationship of ideas is understood better.

(e) **Synthesis:** It is basically about combining the constituent parts to make it a whole. It is antonym of analysis.

(f) **Evaluation:** It involves judgment made about the value of methods and materials for particular purposes.

2. Affective domain: The affective domain (Krathwohl, Bloom, Masia, 1973) includes the manner in which we deal with things emotionally, such as feelings, values, appreciation, enthusiasms, motivations, and attitudes. It includes the following levels:

(a) **Receiving:** willingness to listen

(b) **Responding:** willingness to participate

(c) **Valuing:** willingness to be involved

(d) **Organizing:** willingness to be an advocate of an idea

(e) **Characterization:** willingness to change one's behaviour or way of life

3. Psychomotor domain: The psychomotor domain (Simpson, 1972) includes physical movement, coordination, and use of the motor-skill areas. Development of these skills requires practice and is measured in terms of speed, precision, distance, procedures, or techniques in execution. Thus, psychomotor skills range from manual tasks, such as digging a ditch or washing a car, to more complex tasks, such as operating a complex piece of machinery or dancing. Following are the five different levels of instructional objectives in psychomotor domain:

(a) Imitation: It includes demonstration of a skill by a skilled person and learner tries to follow the same.

(b) Manipulation: A learner tries to experiment with various aspects like manipulating machinery, equipment, etc.

(c) Precision: Accuracy in performing various acts increases with practice.

(d) Articulation: Achieving a desired level of efficiency and effectiveness through practice.

(e) Naturalization: Skill is internalized and an individual is able to adapt, modify, or design new techniques, methods, or procedures according to the requirements of a situation.

Gagne and Briggs classification of Teaching and Instructional objectives

According to this classification, the learning outcomes fall under one of the following categories:

1. Intellectual skills: These skills are crucial for dealing with the environment. They include concept learning, rule learning, and problem solving.

2. Cognitive strategies: These include methods and techniques for one's own learning, remembering, and thinking skills.

3. Verbal information: It refers to organized bodies of knowledge that an individual acquires.

4. Motor skills: They are basically about motions carried out when the brain, nervous system, and muscles work together.

5. Attitudes: They refer to an internal state of an individual.

FACTOR AFFECTING TEACHING

1. Educational qualification of teacher: Higher qualified teacher can provide high scholarly instructions which can effect than general graduate teacher. Many teachers hold different degrees which is the sign of their higher education qualification. A teacher is just B.A. and other teacher is M.A., M.Ed., PhD, if we compare both, then is sure that higher qualified teacher can cede good teaching result.

2. Skills: Skill is an ability to do any work with better way. If a teacher has teaching skill then he can provide effective teaching. Often says that teaching is God gifted but getting good education training and Psychologies best educational books, we can get this skill and create better result.

3. Experience of Teacher: Experience of teacher affects also the teaching. After increasing teaching experience, a teacher learns many new things in teaching experience which he can employ in next time teaching. First day teacher may not effect on students but after 5 years teaching, a teacher can more effect on students.

4. Class – room environment: Class room environment effects also on teaching. This environment is made both by teacher and students. Without both active participation in education, teaching never

effects. If the concentration lives in class room and students listen teacher's voice and teacher also cares the activity of teacher doing interacting with students.

5. Economic Factor: Economic background of teacher and student is also affected teaching. Even salary of teacher effects on his thinking level. Poor and rich students can also classify economically and sometime these factors can effect on effective teaching.

6. Administrative policies of school or college or university: Administrative policies also effect teaching. Teacher wants to instruct with his way but administrative policies is not allowed, so the voice of teach can stop and effect of teaching may slow in class room.

7. Subject Matter: Sometime when a teacher teaches that subject in which he is not specialize , he can not create any effect through his teaching but same teacher can teaches his specialize subject with better way .

8. Parental expectations: What are the expectations of parent on students? This factor can be defined psychologically. If parent wants to frame up his children doctor or engineer and continually stress on student, sometime student may not at that rank, so mentally he can create depression and which can stop effective teaching of teacher.

FUNCTIONS OF TEACHING:

In teaching process, the active or functional part is played by the independent and dependent variable. Mainly following three types of functions are performed by these variables:

I. Diagnostic functions

II. Prescriptive functions

III. Evaluative functions

I. Diagnostic functions:

The goal is to bring desirable changes in the behavior of students. The initial task needs a proper diagnosis for the prescription of appropriate treatment (the actual attempts) for bringing desirable behavioral changes in the students. Accordingly, a teacher has to perform the following diagnostic functions:

1. He has to diagnose the entering behavior of the student. The initial potential of the student in terms of cognitive, cognitive and affective abilities should be properly diagnosed with the help of some diagnostic tests.
2. He has to diagnose and formulate specific educational objectives, the type and amount of behavioral changes he wants to introduce in the student in the light of the entering behavior and environmental conditions.
3. He has to analyze the content, instructional material and environmental facilities available for carrying out his task.
4. He has to diagnose his own potential and capabilities and bring desirable improvement in his own behavior for the success of his own mission.

Although the teacher, as independent variable, is more active in exercising diagnostic functions, yet the role of the student as a dependent variable cannot be underestimated. **He has also to perform certain important diagnostic functions on the basis of his perception for his abilities and responses as follows;**

1. He has to diagnose the strength and weakness of his entry behavior.
2. He has to assess himself in terms of the tools of learning like language and comprehension, power of expression, ability to think and analyze psychomotor skill and emotional behavior.
3. He has to make efforts to know the behavior of the teacher, the types of teaching strategies, the nature of the content and instructional material for the purpose of initiation and response on his part.

II. Prescriptive functions:

On the basis of **diagnosis**, the teacher takes decision about the needed prescription for achieving the stipulated objectives. Accomplishment of objectives needs an appropriate interaction between the teacher and the student which, in turn, needs proper management of the intervening variables by the teacher. Accordingly, he has to perform the following functions;

1. Selecting appropriate contents and organizing them into proper sequence.
2. Selecting proper teaching techniques, strategies and feedback devices in view of the individual difference among the students.
3. Seeking essential cooperation from the students for a purposeful interaction.

In the performance of prescriptive functions also, the teacher is likely to be more active than the students. The prescription is made for the student to bring desirable changes in his behavior. He has to work for the purposeful interaction and give his sincere cooperation for the teacher in exercising the various prescriptive functions.

III. Evaluative functions:

Evaluative function concerned with the tasks of evaluating the progress and outcomes of the prescriptive functions that may be decided in the form of realization of the stipulated objectives. The failure in the realization of the objectives is essentially a failure in the prescriptive functions either due to improper diagnosis or some serious mistakes in prescribing or carrying out the treatment (actual teaching) task.

Various evaluation devices in the form of tests, observations, interviews, rating scales, inventories and unstructured projective techniques are help in exercising evaluative functions. In contrast to diagnostic or prescriptive functions, the student remains more active in the evaluative functions. He has to respond and evaluate his own progress in terms of the abilities acquired and behavior changes occurred. He is taught and helped by the teacher in bringing improvement in his behavior on the basis of his entry behavior and potentialities. Now, it is this turn to see how far the treatment prescribe for done by the teacher is helpful for him. If the prescription suits him he can go ahead with it. If it does not, he must give his full cooperation to the teacher (just like a patient who has to consult his doctor and seek his advice for further diagnosis and subsequent prescription in order to get maximum advantage for bringing improvement in his behavior.

Pedagogy paradigms-

Paradigm: Set of forms/ideas/patterns all of which contain a particular element.

Pedagogy: The art or science of teaching; instructional methods.

EXPLANATION:

Pedagogy is the science and art of education. The aim of pedagogy is to develop the human beings up to the skill acquisition. The teaching is a professional artistry which requires a teacher to

efficiently plan the objective and give the students meaningful knowledge in teaching-learning process. In the process of teaching, every teacher evolved themselves every day and they also develop their unique teaching style based on multiple encounters with their students. In teaching, every day teacher faced challenges and they loop for solution to those challenges.

Pedagogical environment of teaching helps the teacher to understand the teaching-learning process and different teaching strategies. The job of teaching is a complex process which is executed in a sophisticated phases. **More or less there are four phases:**

1. **Planning**
2. **Execution**
3. **Assessment**
4. **Reflection**

The entire process starting from planning to reflection is totally depends on the teachers choice and beliefs in the learning paradigm on how students learn. A teacher is able to change their learning plan if they use some teaching model to organize and implement teaching strategies. There are various methods of teaching as suggested by stewards in education system.

METHODS OF TEACHING

The **traditional or innovative methods** of teaching are critically examined, evaluated and some modifications in the delivery of knowledge are suggested. As such, the strengths and weaknesses of each teaching methodology are identified and probable modifications that can be included in traditional methods are suggested.

1. TRADITIONAL TEACHING METHOD

In the pre-technology education context, the teacher is the sender or the source, the educational material is the information or message, and the student is the receiver of the information. In terms of the delivery medium, the educator can deliver the message via the “chalk-and- talk” method and overhead projector (OHP).

Methods of Teaching

Teaching is both, art and science. It requires a mastermind creativity that the students of different nature and community should be handled carefully. Therefore, it is an art. On the other hand, it calls for exercise of talent and creativity making it and involving repertoire of techniques, procedures and skills which can be studied systematically, described and improved making it science. The teaching profession has successfully faced many challenges and transformations and adopted recent sophistications and technological innovations suitably. All these developments have helped the teaching community to regain a high status in academic campuses transparencies. This directed instruction model has its foundations embedded in the behavioral learning perspective and it is a popular technique, which has been used for decades as an educational strategy in all institutions of learning.

For **classroom practice**, idealists would encourage the use of the discussion and the lecture methods. The discussion method of learning which is popularly known as the **Socratic** Method involves questioning and discussion. It was the method of learning in the **Upanishadic** period of Indian education It is also known as the ‘**Informal dialectic**’ method. Idealists value the use of well-prepared and presented lectures. Lecture should not be a phonographic recitation on facts but a scholarly exposition. It should also not be delivered in an autocratic way. It should be participatory.

- ❖ **Team teaching:** is an innovative approach in teaching large groups in which two or more teachers are involved in planning, executing, and evaluating the learning experiences of a group of students.

- ❖ **Group discussion:** is one of the basic methods of teaching smaller groups. It can be described as communication and interaction within a group around a topic, skill, issue, or problem presented to the group by the trainer or moderator for discussion.
- ❖ **Television or video presentation:** is an improved presentation of radio or audio presentation, and it can virtually bring the whole world inside the classroom. Screening of video presentation is followed by a discussion or task.
- ❖ **A panel:** consists of a small group of six to eight persons. They carry on a guided and informal discussion before an audience.
- ❖ **Brainstorming** is a creative group work in which group members produce a large number of ideas quickly on a given topic or problem for subsequent evaluation. In this method, anyone can exchange remarks with anyone except that the participants are not allowed to criticize the ideas at the time when views are being invited.
- ❖ **Simulation means** creating conditions that are quite similar to actual conditions. Then the training is provided under those conditions.
- ❖ **Tutorial method** is a method employed for teaching small groups for developing skills for solving numerical problems, providing individual guidance, and sorting personal problems.

DEMONSTRATION METHOD: This method is based on the principle of learning by doing and learning from concrete to abstract. The term demonstration means to show. It is adopted in the classroom for the achievement of cognitive, affective, and psychomotor objectives.

- ❖ **Assignments** are given to students for a number of purposes, such as for acquiring additional information, surveying, application of knowledge, and solving numerical problems. Although the main role is of the learner, the teacher too has a crucial role. The teacher has to plan the assignments and guide the student regarding references for collecting relevant information.
- ❖ **Case study:** Unlike traditional lecture-based teaching where student participation in the classroom is minimal, the case method is an active learning method that requires participation and involvement from the student in the classroom.
- ❖ **Computer-assisted Learning (CAL)** is concerned with the use of a computer to mediate the flow of information in a learning process. A computer has the ability to process information very quickly, accurately and to adapt and respond to the learner's need, difficulties, and progress, which is much greater than that of a book or video tape.

HEURISTIC METHOD This method was advocated by Professor Armstrong. In this method, the student has to find out the answer to his/her own problem by unaided efforts. Thus, the child becomes a discoverer of knowledge by developing a spirit of inquiry. The main aim of teaching by this method is not to provide much facts about science, mathematics, grammar, etc. but to teach how knowledge of these can be obtained.

Differentiated instruction is a dynamic, proactive method of teaching. It means that the teacher plans and uses a variety of ways to teach learning. It is a combination of whole group, small group, and individual instruction methods.

Blended Learning: The term originated in USA. There is no clear single definition available for it. Blended learning combines online learning with face-to-face learning. It is also defined as the combination of multiple approaches to pedagogy or teaching.

Methods by Naturalism

Rousseau considers education as a process of living. Being a process, it lasts throughout life or at least from birth to adult life. It finds its meaning for any particular stage, not on a future state. It is not artificial, harsh, unsympathetic, repressive of all natural inclinations, by which "the child as a "little man" is made into a "big man" through the hands of the teacher. Development of the child

through natural process is an enjoyable, rational, harmoniously balanced, ^ useful and hence natural life.

The aim of education is achieved not in adult life, but in each succeeding day, whenever life has its natural activities, its appropriate duties and its corresponding satisfaction. Thus stress is given on direct experience of things. Rousseau, therefore says, "Give your scholar no verbal lessons: he should be taught by experience alone.

Pragmatic Methods

The focus of pragmatic methods of teaching is on the 'child-in-society' and his activities therein rather than the book, the teacher, the subject or exclusively the child of-nature. Learning always occurs as a result of an activity. The teacher has to capitalize upon the activities of children to direct the teaching-learning process. Activity is the basis of all teaching. The child should be enabled to find out information by himself instead of pouring information on him. Children should be encouraged to discover and investigate the facts of life. Education must develop the laboratory habit of mind. The method of teaching should be experimental.

Existentialist Methods

The method of teaching advocated by existentialism is of asking questions, refining answers, asking more questions and pushing the issue until some acceptable conclusion was reached. Existentialists favored the Socratic approach to teaching, as it was inductive, proceeding from the immediate and particular to the abstract and universal. In this method, knowledge and wisdom are gained through personal relationships between the teacher and the pupil. They give emphasis on individual attention. Since emphasis is given on individual attention, they prefer home education to school education.

In existentialist system the teacher cannot impose upon children his own ideas, ideals, ideologies and values. Religious education may be imparted, provided there is no scope for indoctrinations. They advocate a method of teaching which can develop creativity among the pupils.

Methods of Teaching as recommended by Secondary Education Commission (1952-53): The commission suggested that methods of teaching should provide ample opportunities for students to develop clear thinking and clear expression. Individual-centered methods and opportunities for practical application of knowledge should be adopted.

Activity method and project method should be used in school practice.

Establishing of Experimental and Demonstration schools and training in activities such as scout movement, N.C.C., first aid should be encouraged.

Some Specific Methods of Teaching

1. Inferential Problem Solving Technique: Inductive and deductive are two important procedures of systematic approaches to problem solving.

Steps in Inductive Method

- ❖ Recognition of the problem
- ❖ Searching for data
- ❖ Organization of data
- ❖ Framing tentative solutions
- ❖ Elimination
- ❖ Verification

Steps in Deductive Method

- ❖ Recognition of problem
- ❖ Searching for data
- ❖ Reviewing
- ❖ Formulation of inferences
- ❖ Verification

2. Team-Teaching: Team-teaching is also called co-operative teaching. This is a recent idea in the field of education. **M.B. Naik** said, "In a team-teaching method, two or more teachers make a plan of the subjects cooperatively, carry it out, and always evaluate its effects on the students periodically." In team teaching, subject teachers give lectures to a big class. On every working, all the members of the team have a common assembly. Here they discuss the methods used by the fellow-teachers.

3. Micro-Teaching: Micro-teaching is an innovative teaching technique. It is a new development in the field of teaching. The term micro-teaching was first coined by **Dwight Allen of the Stanford University** in 1963.

Features of micro-teaching

- ❖ It is a teacher training technique.
- ❖ It focuses on developing teaching skills.
- ❖ It reduces the classes' size in five to ten students.
- ❖ The size of the topic is also reduced.
- ❖ Micro-teaching is a highly individualized training skill.
- ❖ It provides feedback for trainee's performance.
- ❖ It is an effective device to prepare competent teachers.
- ❖ In this technique learners are provided with immediate knowledge of the correctness of response.

Steps in Micro-teaching

- ❖ Defining the skill
- ❖ Demonstrating the skill
- ❖ Planning the lesson
- ❖ Teaching the lesson
- ❖ Discussion
- ❖ Re-planning
- ❖ Re-teaching
- ❖ Re-discussion
- ❖ Repeating the cycle till the desired level of skill is achieved.

4. Question-Answer technique in teaching: No teacher of elementary or secondary subjects can succeed in his instruction, which has not a fair mastery of the art of questioning.

- ❖ Purposes of questioning:
- ❖ To test the knowledge
- ❖ To locate the difficulty
- ❖ To arouse motivation
- ❖ To secure active participation of students.
- ❖ To apply knowledge
- ❖ To recapitulate the lesson learnt.
- ❖ To promote thinking and originality
- ❖ To increase self-confidence
- ❖ To maintain discipline
- ❖ To promote intellectual and social development.

Underlying the need of questioning **Parkar** Said. "Questioning is the key to all educative activities."

Meaning of Teaching Aids

A teaching aid is something a classroom teacher uses in her class to help students improve reading and other skills, reinforce a skill, or to make learning fun.

Teaching aids can be used in any of the core classes. There are several types of teaching aids to be utilized in a classroom.

Need of Teaching Aids

- ❖ Every individual has the tendency to forget. Proper use of teaching aids helps to retain more concepts
- ❖ Students can learn better when they are motivated properly through different teaching
- ❖ Teaching aids develop the proper image when the students see, hear taste and smell
- ❖ Teaching aids provide complete example for conceptual
- ❖ The teaching aids create the environment of interest for the
- ❖ Teaching aids helps to increase the vocabulary of the
- ❖ Teaching aids helps the teacher to get sometime and make learning permanent.

Types of Teaching Aids

There are many aids available these days. We may classify these aids as follows

- ❖ **Visual Aids**
- ❖ **Audio Aids**
- ❖ **Audio – Visual Aids**

1) Visual Aids: The aids which use sense of vision are called Visual aids.

For example :- actual objects, models, pictures, charts, maps, flash cards, flannel board, bulletin board, chalkboard, overhead projector, slides etc. Out of these black board and chalk are the commonest ones.

2) Audio Aids: The aids that involve the sense of hearing are called Audio aids. For example: – radio, tape recorder, gramophone etc.

3) Audio – Visual Aids: The aids which involve the sense of vision as well as hearing are called Audio- Visual aids. For example – television, film projector, film strips etc.

IMPORTANCE OF TEACHING AIDS

Teaching aids play very important role in Teaching- Learning process.

1) Motivation- teaching aids motivate the students so that they can learn better.

2) Clarification – Through teaching aids, the teacher clarifies the subject matter more easily.

3) Discouragement of Cramming – teaching aids can facilitate the proper understanding to the students which discourage the act of cramming.

4) Increase the Vocabulary – Teaching aids helps to increase the vocabulary of the students more effectively.

5) Saves Time and Money – When the uses teaching aids, it saves him from the long explanations that may take time for students understand

6) Classroom Live and active – Teaching aids make the classroom live and active.

7) Avoids Dullness – This means the class becomes more active, lively and participatory

8) Direct Experience – Teaching aids provide direct experience to the students which make them learn easily

Evaluation Systems

Evaluation is a device through which we can get an exact idea of what students actually achieve from their teaching-learning experiences. **Following are some important evaluation systems:**

1. Examinations: Examination is the concern of the teacher, the greatest premium of parents and the first anxiety of the students. End products of all education efforts are appraised by evaluation.

Importance of Examinations

- (i) Examinations help in testing the achievement of the pupils.
- (ii) Examinations are also helpful in evaluating the individual interests, aptitudes, intelligence, physical, emotional, social and moral development.
- (iii) They also provide an ease to classify the students, to provide guidance, to bring changes in curriculum and form the basis of admissions.

Dr. RadhaKrishnan said, “if examination are necessary, thorough reform of these is still more necessary.”

2. Psychological Evaluation: We evaluate personality because it helps us to know about the physical, mental, emotional and social behavior of the individual, measurement of personality is also helpful in providing proper guidance to the students.

There are three methods of personality assessments namely – psychometric, projective and behavioral assessments.

3. Philosophical Evaluation: There is much controversy about testing, grading and promotion in the field of education. **Philosophers**, who support conservative view on evaluation are of opinion that the intellectual development of the students can be judged in terms of their mastery of subject matter. The best means of determining the student’s intellectual progress is to discover how well he has learned the assigned material. To what extent he has memorized all the facts, vocabulary or formula of a particular subject.

Mind Mapping as a method of teaching was developed by **Tony Buzan in 1960**. A ‘mind map’ is a diagram for representing tasks, words, concepts, or items linked to and arranged around a central concept or subject. It uses a non-linear graphical layout that allows the user to build an intuitive framework around a central concept, and it can turn a long list of monotonous information into a colorful, memorable, and highly organized diagram that works in-line with a learner’s brain’s natural way of doing things.

Microsoft PowerPoint Presentations

PowerPoint is an application program of presentation that is found in **Microsoft Office**. Nowadays, many of the audio-visual teaching aids have been replaced with PowerPoint presentations. Here, the slides give us the flexibility in terms of fonts, visuals, sizes, ability to change, etc. It allows the teachers to reflect on a lesson and correct any changes, and they can create perfect lessons and can print them out. Using PowerPoint improves the students’ learning motivation, increases authentic materials for study, and encourages interaction between the teacher and the students.

Display Boards

Blackboard Or Chalkboard: It is one of the oldest teaching aids; the chalkboard is probably the simplest, cheapest, most convenient, and widely used non-projected visual aid in extension teaching. It is a vehicle for a variety of visual materials. The chalkboard is suitable for use in lectures, training programmes, group meetings, etc. It facilitates step-by-step presentation of the topic, creates a dramatic impact, and sustains audience interest. Presentations may be adjusted according to the receptivity of the audience. It helps the audience to take notes. It helps in comprehension and retention of knowledge.

White Board: Modern classrooms are equipped with boards also called marker boards or multipurpose boards. They require special erasable markers. A felt eraser is required to erase the surface soon after use. Markers are available in different colors. It may be used as surface for projecting films, slides, and overhead transparencies. A white board with a steel backing can be used as magnetic board for display. An interactive white board is a large interactive display that connects to a computer and projector. A projector projects the computer's desktop onto the board's surface, where users control the computer using a pen, finger, or other device. The board is typically mounted to a wall or to a floor stand.

Bulletin Board: A bulletin board displays messages. It is a surface on which bulletins, news, information, and announcements of specific or general interest can be displayed. Bulletin boards are of different sizes with provisions to hold pins, book exhibits, and other materials.

Flannel Board And Flannel Graph: A flannel board is a visual aid in which messages are written or drawn on thick paper and presented step-by-step to the audience to synchronize with the talk. The board is a flannel-covered flat surface. Flannel is stretched and then glued to a piece of plywood or heavy cardboard.

Magnetic Board: It can be a sheet of tinplate; it is simply a type of chalkboard, and the surface of which is treated or coated with a porcelain-like substance. The base of the board is steel, and pictures and objects can be pasted or mounted with small magnets and can easily be moved about.

Peg Board: Perforated hardboard is tempered hardboard, which is pre-drilled with evenly spaced holes. The holes are used to accept pegs or hooks to support various items, such as tools in a workshop.

Important Dates Related to Education

January 04 World Braille Day—A form of written language for blind people, in which characters are represented by patterns of raised dots that are felt with the fingertips

January 24 National Girl Child Day also called as **Balika Divas**

February 21 International Mother Language Day

February 28 National Science Day—To commemorate invention of the Raman Effect in India by the Indian physicist, **Sir Chandrasekhara Venkata Raman** on the same day in 1928

June 21 International Day of Yoga— United Nations proclaimed **21 June** as International Yoga Day

September 5 Teachers' Day is celebrated on 5th September every year, which is also the birthday of **Dr Sarvepalli Radhakrishnan**, the first Vice-President of independent India and the second President of the country.

September 8 International Literacy Day—To highlight the importance of literacy in life and remind ourselves of the status of literacy and adult learning worldwide

September 14 Hindi Day

October 5 World Teachers' Day—UN World Teachers' Day commemorates the work of teachers and their contributions to society

October 11 International Day of Girl Child

October 20 World Statistics Day

November 1 National Education Day—It is also the birthday of **Maulana Abul Kalam Azad**, eminent educationist and the first Education Minister of independent India

November 14 Children's Day—It is also the birthday of independent India's first Prime Minister Pt. Jawaharlal Nehru

November 20 Universal Children's Day.

SWAYAM

Under **SWAYAM** or Study **Webs of Active –Learning for Young Aspiring Minds** programme of Ministry of Human Resource Development, Government of India, professors and faculties of centrally funded institutions like IITs, IIMs, central universities will offer online courses to citizens of India.

SWAYAM is an instrument for **self-actualization** providing opportunities for a life-long learning. Here learner can choose from hundreds of courses, virtually every course that is taught at the university / college / school level and these shall be offered by best of the teachers in India and elsewhere. If a student is studying in any college, he/she can transfer the credits earned by taking these courses into their academic record. If you are, working or not working, in school or out of school, **SWAYAM** presents a unique educational opportunity to expand the horizons of knowledge.

All courses would be offered free of cost under this programme however fees would be levied in case learner requires certificate.

In the first phase, IIT Bombay, IIT Madras, IIT Kanpur, IIT Guwahati, University of Delhi, **Jawahar Lal Nehru University**, IGNOU, IIM Bangalore, IIM Calcutta, Banaras Hindu University, alone as well as with the help of faculty from foreign universities will be offering courses in areas of engineering education, social science, energy, management, basic sciences. At least one crore students are expected to benefit in 2 to 3 years through this initiative. India has become one of the few countries in the World which has its own online interactive learning platform that provides, not only video lectures, reading material but also assignments/quizzes that could end up in securing credits after completing the assessment system. The then President of India **Shri Pranab Mukherjee** recently launched the **SWAYAM**, the portal that takes high quality education to the doorstep of everyone and the **SWAYAM Prabha** – the **32 DTH channels** operationalized for telecasting high quality educational content free of charge using the **GSAT-15** satellite transponders..

Features of SWAYAM

- ❖ High quality learning experience using multimedia on anytime or anywhere basis.
- ❖ One stop web location for interactive e-content for all courses from school to university level.
- ❖ State of art system that allows easy access monitoring and certification.
- ❖ Peer group interaction and discussion forum to clarify doubts.
- ❖ Hybrid model that adds to the quality of class room teaching.

Nine national coordination's are:

- ❖ **AICTE**- self paced and international courses
- ❖ **NPTEL**- engineering

- ❖ **UGC**- non technical PG education
- ❖ **CEC**- UG education
- ❖ **NCERT**- school education
- ❖ **IGNOU**- out of school students or distance education
- ❖ **IIMB**- management studies
- ❖ **NITTR**- teacher training programme

SWAYAM PRABHA

The **SWAYAM PRABHA** is a group of **32 DTH** channels devoted to telecasting of high-quality educational programmes on **24X7** basis using the **GSAT-15 satellite**. Every day, there will be new content for at least (4) hours which would be repeated 5 more times in a day, allowing the students to choose the time of their convenience. The channels are uplinked from **BISAG, Gandhinagar**. The contents are provided by NPTEL, IITs, UGC, CEC, IGNOU, NCERT and NIOS. The **INFLIBNET** Centre maintains the web portal.

The DTH Channels shall cover the following:

- a) **Higher Education:** Curriculum-based course contents at post-graduate and under-graduate level covering diverse disciplines such as arts, science, commerce, performing arts, social sciences and humanities, engineering, technology, law, medicine, agriculture, etc. All courses would be certification-ready in their detailed offering through SWAYAM, the platform being developed for offering MOOCs courses.
- b). **School education (9-12 levels):** modules for teacher's training as well as teaching and learning aids for children of India to help them understand the subjects better and also help them in preparing for competitive examinations for admissions to professional degree programmes.
- c). **Curriculum-based** courses that can meet the needs of life-long learners of Indian citizens in India and abroad.
- d). **Assist students** (class 11th & 12th) prepare for competitive exams.

MOOC

A **Massive Open Online Course (MOOC)** is a web-based platform which provides unlimited number of students worldwide with a chance of distance education with the best institutes in the world. It was established back in 2008 and gained momentum in 2012 as a popular learning tool. Many MOOCs have communities that have interactive sessions and forums between the student, professors and Teaching Assistants (TAs) along with the study/course material and video lectures.

MOOCs in India and Abroad

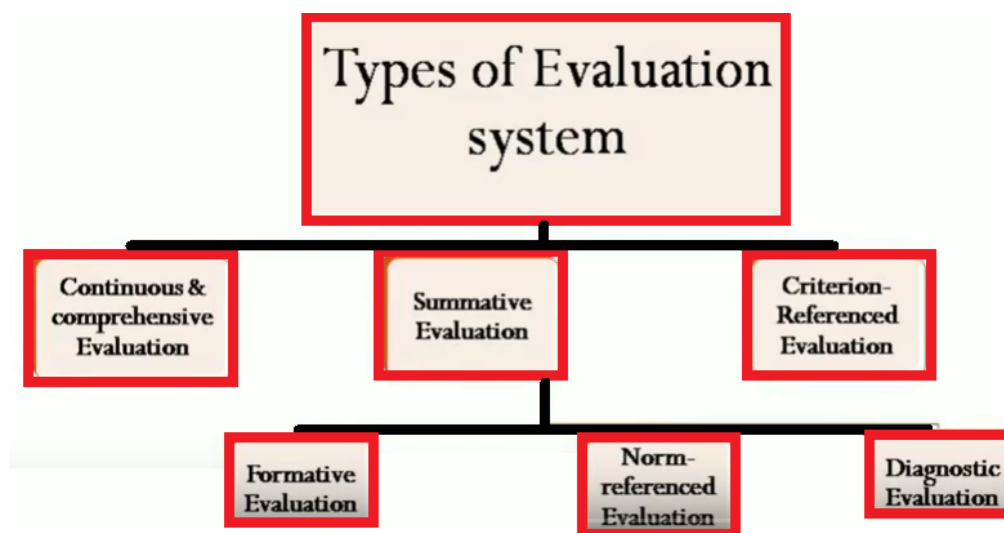
There are various notable institutions, both non-profit and commercial, that offer these courses worldwide with the help of MOOC providers. A few of these are listed below,

- **NPTEL (India):** Indian Institutes of Technology (IITs) and Indian Institute of Science (IISc.) offer online courses through this platform which require no registration and are free of cost.
- **WizIQ (India and USA):** IIT Delhi, India offers this course through this platform which requires registration and fees to study courses offered by them.
- **Open2Study:** The headquarters of this platform for online courses is based out of Australia.
- **Coursera:** The headquarters of this platform for online courses is based out of USA.
- **EdX:** The headquarters of this platform for online courses is based out of USA.

- **Udemy:** The headquarters of this platform for online courses is based out of USA.

EVALUATION: Evaluation is the process of examining a subject & rating it based on its important features. In education how much a student has succeeded in his aim, can only be determined through evaluation. Its objectives are:

- ❖ To assess the learners achievement at the end of the teaching learning process.
- ❖ To motivate the students for learning.
- ❖ To measure the effectiveness of curriculum, teaching methods & programs.
- ❖ To give grades to the students at the end of the course.



1. **Continuous evaluation:** it covers all aspects of the student's development. CBSE evaluation system is based on this CCE method. Continuous system refers that it is not just an examination but a part of the evaluation process. It is continuous process with no fixed time limit. Comprehensive system refers to assess all the aspects of the child's development. Thus different techniques are used by the teachers to evaluate the performance of the child.
2. **Summative evaluation:** it is the method of judging the worth of the programme at the end. It determines the objectives of the instruction & is used for arranging course grades.
 - ❖ **Formative evaluation:** it is the method of judging the worth of the programme while the programme activities are in progress. It also identifies the specific learning error that needs to be corrected. Its examples are; units & chapters.

FORMATIVE EVALUATION	SUMMATIVE EVALUATION
Evaluation the learning process	Evaluation after the course completion
Monitor the learning process	Assign grades
The purpose is to improve students' learning	The purpose is to evaluate students achievements
This include little content area	This include chapters
Consider evaluation as a process	Consider evaluation as a product

❖ **Norm- referenced evaluation:** Norm- referenced evaluation refers to standardized tests that are designed to compare and rank test takers in relation to one another. IQ tests are examples of well-known norm-referenced tests.

❖ **Diagnostic assessment:** Diagnostic assessment is a form of pre-assessment that allows a teacher to determine student's individual strength, weaknesses, knowledge & skill before to instruction. It is primarily used to diagnose student's difficulties and curriculum planning.

3. **Criterion referenced test:** Criterion referenced test and assessments are designed to measure student performance against a fixed set of predetermined criteria or learning standards.

Definitions of Key Words:

Academic Year: Two consecutive (one odd + one even) semesters constitute one academic year.

Choice Based Credit System (CBCS): The CBCS provides choice for students to select from the prescribed courses (core, elective or minor or soft skill courses).

Course: Usually referred to, as 'papers' is a component of a programme. All courses need not carry the same weight. The courses should define learning objectives and learning outcomes. A course may be designed to comprise lectures/ tutorials/laboratory work/ field work/ outreach activities/ project work/ vocational training/viva/ seminars/ term papers/assignments/ presentations/ self-study etc. or a combination of some of these.

Credit Based Semester System (CBSS): Under the CBSS, the requirement for awarding a degree or diploma or certificate is prescribed in terms of number of credits to be completed by the students.

Credit Point: It is the product of grade point and number of credits for a course.

Credit: A unit by which the course work is measured. It determines the number of hours of instructions required per week. One credit is equivalent to one hour of teaching (lecture or tutorial) or two hours of practical work/field work per week.

Cumulative Grade Point Average (CGPA): It is a measure of overall cumulative performance of a student over all semesters. The CGPA is the ratio of total credit points secured by a student in various courses in all semesters and the sum of the total credits of all courses in all the semesters. It is expressed up to two decimal places.

Grade Point: It is a numerical weight allotted to each letter grade on a 10-point scale.

Letter Grade: It is an index of the performance of students in a said course. Grades are denoted by letters O, A+, A, B+, B, C, P and F.

Programme: An educational programme leading to award of a Degree, diploma or certificate.

Semester Grade Point Average (SGPA): It is a measure of performance of work done in a semester. It is ratio of total credit points secured by a student in various courses registered in a semester and the total course credits taken during that semester. It shall be expressed up to two decimal places.

Semester: Each semester will consist of 15-18 weeks of academic work equivalent to 90 actual teaching days. The odd semester may be scheduled from July to December and even semester from January to June.

Transcript or Grade Card or Certificate: Based on the grades earned, a grade certificate shall be issued to all the registered students after every semester. The grade certificate will display the course details (code, title, number of credits, grade secured) along with SGPA of that semester and CGPA earned till that semester.

What is Choice Based Credit System?

University Grants Commission has come up with the **Choice Based Credit System (CBCS)** programme in which the students have a choice to choose from the prescribed courses, which are referred as core, elective or minor or soft skill courses and they can learn at their own pace and the entire assessment is graded-based on a credit system. The basic idea is to look into the needs of the students so as to keep up-to-date with development of higher education in India and abroad. **CBCS** aims to redefine the curriculum keeping pace with the liberalization and globalization in education. **CBCS** allows students an easy mode of mobility to various educational institutions spread across the world along with the facility of transfer of credits earned by students.

How does it work?

It has the following basic elements:

- **Semesters:** The assessment is done semester wise. A student progresses on the basis of the courses taken rather than time like three years for science, arts, commerce or four years for engineering etc. Each semester will have 15–18 weeks of academic work which is equal to 90 teaching days. There is flexibility in creating the curriculum and assigning credits based on the course content and hours of teaching.
- **Credit system:** Each course is assigned a certain credit. When the student passes that course, he earns the credits which are based on that course. If a student passes a single course in a semester, he does not have to repeat that course later. The students can earn credits according to his pace.
- **Credit transfer:** If for some reasons, he cannot cope with the study load or if he falls sick, he has the freedom to study fewer courses and earn fewer credits and he can compensate this in the next semester.
- **Comprehensive continuous assessment:** There is a continuous evaluation of the student not only by the teachers but also by the student himself.
- **Grading:** UGC has introduced a **10-point grading system as follows:**
 - ❖ **(Outstanding): 10**
 - ❖ **A+ (Excellent): 9**
 - ❖ **A (Very Good): 8**
 - ❖ **B+ (Good): 7**
 - ❖ **B (Above Average): 6**
 - ❖ **C (Average): 5**
 - ❖ **P (Pass): 4**
 - ❖ **F (Fail): 0**
 - ❖ **Ab (Absent): 0**

COMPUTER BASED TESTING:

Digital tools and technology are becoming standard even in traditional face-to-face learning environments. Two of the most widely adopted educational technologies are video lecture and computer based assessment. Video lectures are pretty self-explanatory: teachers record their lectures for students to watch online at their convenience.

Computer based assessment is, in essence, the practice of giving quizzes and tests on the computer instead of using pencil and paper. Computer based assessment is already used widely in many different environments. For example, the last time you took a written driver's test you probably used a computer terminal. This type of testing is also being used in schools, starting as early as third

grade, often to deliver standardized tests, as well as in colleges and universities and in employee training programs.

Computer based assessment is a broad term that can encompass several different types of testing tools and technologies. One of the most common is online assessment software, in which an instructor uses an online assessment creation software to develop a test. Then, the instructor provides a link to the students, who take the test online. The online assessment creator automatically takes care of all of the administrative tasks—tracking who has completed the test, collecting data such as how long students spend on each question, and even grading the assessment and providing feedback to the students.

POINTS TO REMEMBER:

- ❖ **Heuristic method** by Armstrong of teaching. The word 'Heuristic' means to discover. In this method, the students are put in the place of an independent discoverer.
- ❖ **Cognitivism**: The basis of cognitive learning theory is based around how the brain of the learner gains and processes information. Perhaps the most widely accepted cognitive learning theory is Gagne's conditions of learning theory.
- ❖ **Constructivism**: In constructivism, students obtain knowledge by filtering new knowledge through their own personal experiences. Perhaps the most famous constructivist theorists are Jean Piaget, John Dewey, Maria Montessori and Lev Vygotsky.
- ❖ **Montessori** discovered that children's innate power for learning worked best when they are in a safe, hands-on-learning environment.
- ❖ **Understanding by Design** is a book written by **Grant Wiggins and Jay McTighe** that offers a framework for designing courses and content units called "Backward Design."
- ❖ The most famous theorist in **student-centered learning** was **Carl Rogers**. He recommended education be conducted in a non-threatening environment to enhance student performance and that students not only learn from teachers; teachers also learn from students. *On Becoming an Effective Teacher* (Book) describes exemplary practices like Teach For America, which highlight the power of person-centered teaching to bring about higher student achievement and emotional intelligence. Lyon situates the classic with the cutting-edge, integrating wisdom with research, anecdote with practical advice, to find truths that reveal paths toward effective teaching.
- ❖ **Behaviorism**: In behaviorism it is hypothesized learning occurs when the learner is subjected to a stimuli, such as new knowledge. Behaviorism is a psychological approach. Some of the most famous behaviorist theorists include Pavlov, Watson and primarily in education, Skinner.
- ❖ **John Broadus Watson** (January 9, 1878 – September 25, 1958) was an American psychologist who established the psychological school of behaviorism.
- ❖ **"Pedagogy 2.0."** All students, no matter what their age, are now juggling work, study and technology. This technology has caused a blurring effect between their academic, work and social lives. Students are now consumers of information. This was the vision of Tim Berners-Lee, the creator of the internet who noted in 2000, "the information has something to which everyone has immediate and intuitive access, and not just to browse, but to create **McLoughlin** and **Lee** outlined guidelines for effective implementation of Pedagogy 2.0:

1. Micro-units of content generated by students and faculty
2. A dynamic curriculum open to learner input
3. Multiple opportunities for various types of communication
4. Contextualized, reflective learning processes
5. Informal and formal resources that are global in scope
6. Scaffolding between students, peers, faculty, experts and communities

7. Authentic task-driven, experiential learning

- ❖ **Heutagogy** was first defined by Hase and Kenyon (2000) as a “form of self-determined learning”.
- ❖ **Gerstein (2013)** defines Education 3.0 as a “connectivist, heutagogical approach”.
- ❖ **Gestalt psychology** is an attempt to understand the laws behind the ability to acquire and maintain meaningful perceptions in an apparently chaotic world.
- ❖ **Thematic Apperception Test (TAT)** - Developed at Harvard University by Henry Murray in 1930.
- ❖ In India, the Teachers’ Day is celebrated on **5th September every year**, which is also the birthday of **Dr. Sarvepalli Radhakrishnan**, the first Vice-President of independent India and the second President of the country.
- ❖ The World Teachers’ Day is celebrated on **October 5**.
- ❖ **International Literacy Day** is celebrated every year on **8th September** to highlight the importance of literacy in life and remind ourselves of the status of literacy and adult learning worldwide.
- ❖ India celebrates the **National Education Day** on **11th November every year**, which is also the birthday of **Maulana Abul Kalam Azad**, eminent educationist and the **first Education Minister of independent India**.
- ❖ In India, **Children’s Day** is celebrated on **14th November** every year which is also the birthday of independent **India’s first Prime Minister Pt. JawaharLal Nehru**, who loved children very much. Universal Children’s Day is celebrated on November 20.
- ❖ **National Science Day** is celebrated in India on **28 February** each year to mark the discovery of the Raman Effect by **Indian physicist Sir Chandra shekhara Venkata Raman on 28 February 1928**. For his discovery, Sir C.V. Raman was awarded the Nobel Prize in Physics in 1930.
- ❖ Every year on the **24th of January**, the **National Girl Child Day** is celebrated as a national observance day for the girl child.
- ❖ **Andragogy** refers to methods and principles used in adult education. The word comes from the Greek meaning "man", and agogos, meaning "leader of"; it literally means "leading man", whereas
- ❖ **"Pedagogy"** literally means "leading children."
- ❖ The President of India, **Shri Pranab Mukherjee** attended the launch of SWAYAM, 32 SWAYAM Prabha DTH Channels and National Academic Depository at the National Convention on Digital Initiatives organized by Ministry of Human Resource Development, Government of India today (July 9, 2017) in New Delhi.
- ❖ The **SWAYAM PRABHA** is a group of 32 DTH channels devoted to telecasting of high-quality educational programmes on 24X7 basis using the GSAT-15 satellite.

EXPECTED MCQs

1. Which of the following applies in the case of discovery learning?
 1. It is a constructivist approach based.
 2. It was introduced by Jerome Bruner.
 3. It is a method of inquiry based instruction.

Codes:

- a. 1 & 3 b. 2 & 3 c. 1 & 2 d. 1, 2 & 3

Answer: d

2. As learning is continuous, a teacher must start teaching at the level of students mind for their better learning. This is called as
 - a. Principle of clarity
 - b. Principle of association.

- c. Principle of active process.
- d. Principle of multiple exposure.

Answer: b

3. Which of the following are the methods of learning?

- 1. Teaching 2. Trial and error 3. Imitation 4. Experimentation 5. Questioning
- 6. Reflection

Codes:

- a. 1 2 3 & 5
- b. 2 3 4 & 6
- c. 1 3 & 5
- d. All of the above.

Answer: d

4. The teaching can be defined as

- a. Bipolar process
- b. Tripolar process
- c. Quadrilateral process
- d. All of the above

Answer: d

5. It is almost simultaneous occurrence of the stimuli and of the responses to them, it is called as

- a. Generalization and discrimination
- b. Contiguity
- c. Reinforcement
- d. Practice

Answer: b

6. Which of the following statements applies in the context of online teaching methods?

- 1. Teacher does not help in construction of knowledge.
- 2. There is more role of learners in the instructional process.
- 3. The delivery of instruction is always verbal.
- 4. There are more chances of self-learning and motivation.
- 5. It is rigid in nature.

Codes:

- a. 1 2 & 4
- b. 2 & 4
- c. 2 3 & 5
- d. 1 3 & 5

Answer: b

7. Which of the following statements are correct in the context of learning process?

- a. the context can be both filed independent and filed dependent
- b. the learners are always reflective in nature

- c. there is no scope for practical thinkers
- d. all of the above

Answer: a

8. Which of the following can be described as the emotional changes during adolescence stage?

- 1. It is a stage of conscience formation.
- 2. It is invincible stage of thinking and acting.
- 3. The genetic changes to environmental factors are called as a differential susceptibility model.
- 4. There is reawakening of libido
- 5. The outcomes are worse for girls than in case of boys

Codes:

- a. Only 1 2 & 3
- b. Only 2 3 & 4
- c. Only 1 3 & 5
- d. All of the above

Answer: d

10. Which of the following stages have been defined by Piaget for the cognitive development in the ascending order?

- a. Sensory period, pre-operational period, concrete operational period, formal operational period.
- b. Pre-operational period, sensory period, concrete operational period, formal operation period.
- c. Sensory period, concrete operational period, pre-operational period, formal operational period.
- d. Sensory period, formal operational period, pre-operational period, concrete operation period.

Answer: a

11. During which of the following stages, the purpose of process of adjustment is to bring about a state of equilibrium in the life of individuals is more specific?

- a. Emotional changes
- b. Cognitive development
- c. Social changes
- d. Physical changes

Answer: b

12. Which of the following changes are more prominent during the social changes of adolescence?

- a. It is period of storm and stress during transition
- b. There is feeling of homophily as there is mix up transition from single sex to mixed sex.
- c. There deviant peer contagion that may show other signs of approval.
- d. All of the above.

Answer: d

13. Which of the following types of evaluation applies more during adult stage?

1. By learner collected evidence validated by peers, facilitators, experts
2. It is basically criterion- referenced.

Codes:

- a. Only 1
- b. Only 2
- c. Both 1 & 2
- d. None of the above

Answer: c

14. Microteaching is a technique aiming to prepare teacher candidates to the real classroom setting. Which of the following is correct order of phases of microteaching?

1. Knowledge acquisition phase
2. Skill acquisition phase
3. Transfer phase

Codes:

- a. 1, 2, 3
- b. 1, 3, 2
- c. 2, 1, 3
- d. 3, 1, 2

Answer: a

15. From the following list of statements, select those which indicate the features and basic requirements of effective teaching.

1. Teaching effectiveness depends upon communication
2. Effective teaching entails ability to develop relationships with their students.
3. An effective teacher has to be a good seller of ideas.
4. Effective teaching is always formal in nature
5. Effective teacher who are most successful in helping students to learn.

Choose the correct answer who are most successful in helping students to learn

- a. 1, 2, 3 & 5
- b. 2, 3 & 4
- c. 2, 3 & 5
- d. 1, 2 & 5

Answer: d

16. Consider the following statements:

1. The curriculum covers the whole spectrum of teaching learning activities in the educational institution.
2. The syllabus is not restricted to examinable portions of the curriculum

Which of the above is true?

- a. Only 1
- b. Only 2
- c. Both 1 & 2

d. None of the above

Answer: b

17. Given below are two statements, one labelled as assertion (A) and the other labelled as reason ®.

Assertion (A): in criterion referenced tests, an individual's score and how that score is categorized is not affected by the performance of other students.

Reason (R): criterion referenced tests compare a person's knowledge or skills against a predetermined standards, learning goal, performance level or other criterion.

Codes:

- a. Both A & R are true & R is the correct explanation of A
- b. Both A & R are true but R is not the correct explanation of A
- c. A is true but R is false
- d. A is false but R is true.

Answer: b

18. From the following list of statements, select those which indicate the features and basic requirements of teaching.

- 1. Effective teaching must include some feedback.
- 2. Teaching means organizing and supervising
- 3. Teaching implies making others learn.
- 4. Teaching requires convincing others.
- 5. There can be teaching without formal communication.

Codes:

- a. 1, 2, 3 & 5
- b. 1, 3 & 5
- c. 2, 3, 4 & 5
- d. All of the above

Answer: b

19. Which of the following are the underlying purposes of teaching aids?

- 1. To motivate students to learn.
- 2. Teaching aids are helpful in meeting individual differences
- 3. Teaching aids makes the abstract ideas concrete
- 4. To make learning permanent

Codes:

- a. 1, 2 & 3
- b. 2, 3 & 4
- c. 1, 3 & 4
- d. All of the above

Answer: d

20. In the two lists given below, list-I provides the list of teaching methods, while list-II indicated the factors helpful in rendering them effective. Match the two lists and choose the correct answer from the code given below.

List-I (teaching methods)	List- II (factors helpful in making them effective)
1. Expository method	a. Promotes students autonomy and enhance learning.
2. Discovery method	b. Open-ended and collaborative exchange of ideas.
3. Discussion method	c. Learning by doing
4. Personalized method	d. Systematic step by step presentation.

Codes:

- a. 1-C, 2-D, 3-B, 4-A
- b. 1-D, 2-C, 3-A, 4-B
- c. 1-D, 2-C, 3-B, 4-A
- d. 1-D, 2-B, 3-C, 4-A

Answer: c

21. Arrange the following activities of classroom teaching in a logical order.

- 1. Analysis of the work done
- 2. Planning and presentation
- 3. Presentation of material
- 4. Modification and improvement

Codes:

- a. 2, 3, 1 & 4
- b. 3, 2, 1 & 4
- c. 2, 3, 4 & 1
- d. 2, 1, 3 & 4

Answer: a

22. While comparing hearing and listening, we can say that

- a. Hearing is a physical process, listening is a psychological process
- b. Listening is a physical process, hearing is a psychological process
- c. Both are purely physical processes
- d. Both are purely biological processes

Answer: a

23. Which one of the following is a product of learning?

- a. Intelligence
- b. Maturation
- c. Skills
- d. Memory

Answer: c

24. The ability to locate, evaluate and effectively use information is an important trait known as

- a. Critical thinking
- b. Information literacy
- c. Hearing
- d. Selective attention

Answer: d

25. Which theory of learning has found that knowledge of internal processes is crucial for the understanding of learning?

- a. Cognitive theory
- b. Stimulus-response theorists
- c. Operant conditioning theorists
- d. Classical conditioning theorists

Answer: a

26. Consider the following statements:

- 1. Education is a natural process
- 2. Education is a social process

Codes:

- a. Only 1
- b. Only 2
- c. Both 1 & 2
- d. None of the above

Answer: c

27. The knowledge that is acquired without inference and use of reason is called as

- a. Demonstrative knowledge
- b. Logical knowledge
- c. Experiential knowledge
- d. Intuitive knowledge

Answer: d

28. Which of the following statements are true about coherent curriculum?

- 1. It is well organized and purposefully designed to facilitate learning
- 2. It is free of academic gaps and needless repetitions
- 3. It is aligned across lessons, courses, subject areas and grade levels

Codes:

- a. 1 & 3
- b. 1 & 2
- c. 2 & 3
- d. 1, 2 & 3

Answer: d

29. Constructivist approach to teaching-learning process is being emphasized at all levels of education. Which of the following methods is mainly based on this approach?

- a. Lecture method
- b. Project method
- c. Discussion method
- d. All of the above

Answer: a

30. Which of the following assists students in managing their own learning by modeling a problem-solving technique?

- a. Drill and practice
- b. Mental modelling
- c. Discovery learning
- d. Direct instruction

Answer: b

UNIT-2

RESEARCH APTITUDE

Research is defined as a careful consideration of study regarding a particular concern or a problem using scientific methods. **Inductive research** methods are used to analyze the observed phenomenon whereas, **deductive methods** are used to verify the observed phenomenon. Inductive approaches are associated with qualitative research and deductive methods are more commonly associated with quantitative research.

One of the most important aspects of research is the statistics associated with it, conclusion or result. It is about the “thought” that goes behind the research. Research is conducted with a purpose to understand.

- ✚ What do organizations or businesses really want to find out?
- ✚ What are the processes that need to be followed to chase the idea?
- ✚ What are the arguments that need to be built around a concept?
- ✚ What is the evidence that will be required that people believe in the idea or concept?

Some important terms:

Epistemology is a branch of philosophy that deals with the origin, nature, methods to acquire knowledge, validity, and limits of human knowledge.

Rationalism tends to believe that logic and reason as the means of acquiring knowledge. Mind is given the authority over senses. This is basically a priori use of logic and reason come first to conclude something before experience. Rationalism is associated with deduction.

Empiricists claim that sense experience is the ultimate starting point for all our knowledge. The senses give us all our raw data about the world, and without this raw material, there would be no knowledge at all. This is termed as a posteriori. It is related to induction.

Research Paradigms: There is difference between natural sciences and social sciences, and so is the difference between research approaches relating to them. Hence, there are two competing paradigms to acquire knowledge. The paradigms are grouped as positivist paradigm and interpretive paradigms.

Positivist paradigm: It is associated with quantitative research strategies. There is one particular view of how research should be conducted, which suggests that we should carry out research in social sciences in ways that are similar to the methods within the natural sciences (physics, chemistry, and biology). This is called the **positivist or scientific** approach. According to the positivist approach, the research design should be highly structured, the methods should be reliable, and the research design should aim to generate large scale, statistically based studies.

Interpretive paradigm: It is usually associated with qualitative research strategies. It is specifically applicable in social sciences such as sociology, political science, etc.

Verstehen: The term is closely associated with the work of the German sociologist, Max Weber. In social sciences, such as anthropology and sociology, **Verstehen** means a systematic interpretive process in which an outside observer of a culture attempts to relate to it and understand others. **Verstehen** roughly translates to ‘meaningful understanding’ or ‘putting yourself in the shoes of others to see things from their perspective’.

Positivist paradigm is mostly associated with quantitative research strategies. The term positivism was coined by the **French philosopher Auguste Comte in 19th century**. The term positivist has no negative connotation. In philosophy, positivism mainly adheres to the idea that factual knowledge gained through observation is trustworthy. Positivism depends on quantifiable observation that leads to statistical analysis. Here, the role of the researcher is limited to data collection and interpretation in an objective way. He is independent from the study and there are no provisions for human interests within the study. Positivists usually adopt deductive approach, the concentration is on facts.

Ontology: assumptions about the nature of reality and knowledge.

Axiology: value systems and ethical principles.

Interpretive paradigm is usually associated with qualitative research strategies. It is specifically applicable in social sciences like sociology, political science, etc.

Theory A theory is a set of systematically related statements, including some law-like generalizations that can be tested empirically. These generalization provide hypotheses and these hypotheses determine what must be measured. Construct is popularly termed as the concept. A construct is an abstract entity, that is, it is not something physical.

***There are many approaches to carry out the research. Some of them have been mentioned below:**

Positivist/post-positivist paradigm: to discover laws that are generalizable and govern the universe.

Constructivist/ interpretative paradigm: to understand and describe human nature.

Transformative/emancipatory paradigm: to destroy myths and empower people to change society radically.

Postcolonial/ indigenous research paradigm: to challenge deficit thinking and pathological descriptions of the former colonized and reconstruct a body of knowledge that carries hope and promotes transformation and social change among the historically oppressed.

CHARACTERISTIC OF ANY RESEARCH-

Following are few important characteristic of any research:

- **Empirical**: Research is based on direct experience or observation by the researcher.
- **Logical**: Research must be based on valid procedures and principles.
- **Cyclical**: Research is a cyclical process because it starts with a problem and ends with a problem. The result of research can be negative, positive or even nil.
- **Analytical**: Research utilizes proven analytical procedures in gathering the data, whether historical, descriptive, and experimental and case study.
- **Critical**: Research exhibits careful and precise judgment.
- **Methodical**: Research is conducted in a methodical manner without bias using systematic method and procedures.
- **Reliability**: The research design and procedures are replicated or repeated to enable the researcher to arrive at valid and conclusive results.

What are the types of Research?

Following are the types of research:

Basic Research: Basic research is mostly conducted to enhance knowledge. It covers fundamental aspects of research. The main motivation of this research is knowledge expansion. It is a non-commercial research and doesn't facilitate in creating or inventing anything. For example, an experiment is a good example of basic research.

Applied Research: Applied research focuses on analyzing and solving real-life problems. This type of research refers to study that helps solve practical problems using scientific methods. This research plays an important role in solving issues that impact overall well-being of humans. For example, finding a specific cure for a disease.

Problem Oriented Research: As the name suggests, problem-oriented research is conducted to understand the exact nature of the problem to find out relevant solutions. The term "problem" refers to having issues or two thoughts while making any decisions.

For e.g Revenue of a car company has decreased by 12% in the last year. The following could be the probable causes: There is no optimum production, poor quality of a product, no advertising, economic conditions etc.

Problem Solving Research: This type of research is conducted by companies to understand and resolve their own problems. Problem solving research uses applied research to find solutions to the existing problems.

Qualitative Research: Qualitative research is a process that is about inquiry that helps in-depth understanding of the problems or issues in their natural settings. This is a non- statistical research method.

Qualitative research is heavily dependent on the experience of the researchers and the questions used to probe the sample. The sample size is usually restricted to 6-10 people in a sample. Open ended questions are asked in a manner that one question leads to another. The purpose of asking open ended questions is to gather as much information as possible from the sample.

Action Research: The term 'action research' was coined during 1940s by **Kurt Lewin**, a German-American social psychologist who is widely considered to be the founder of this field. Action research refers to a wide variety of evaluative, investigative, and analytical research methods designed to diagnose problems or weaknesses—whether organizational, academic, or instructional—and help researchers to develop practical solutions to address them quickly and efficiently.

Quantitative Research: Quantitative research is a structured way of collecting data and analyzing it to draw conclusions. Unlike qualitative research, this research method uses computational, statistical and similar method to collect and analyze data. Quantitative data is all about numbers.

Quantitative research involves a larger population as, more number of people means more data. In this manner, more data can be analyzed to obtain accurate results. This type of research method uses close ended questions because, in quantitative research, the researchers are typically looking at measuring the extent and gathering foolproof statistical data.

Online surveys, questionnaires, and polls are a preferable data collection tools used in quantitative research. There are various methods of deploying surveys or questionnaires. In recent times online surveys and questionnaires have gained popularity. Survey respondents can receive these surveys on mobile phones, emails or can simply use the internet to access surveys or questionnaires.

What is the purpose of Research?

There are three purposes of research:

1. Exploratory Research: As the name suggests, exploratory research is conducted to explore the research questions and may or may not offer a final conclusion to the research conducted. It is conducted to handle new problem areas which haven't been explored before. Exploratory research lays the foundation for more conclusive research and data collection. For example, a research conducted to know the level of customer satisfaction among the patrons of a restaurant.

2. Descriptive Research: the term descriptive is self-explanatory and the research that describes a situation, an event and an institution is descriptive research. It describes the nature of a situation as it exists at the time of study. Descriptive research answers questions who, what, where. Descriptive research is a quantitative research method. In simple words, descriptive research is all about describing the phenomenon, observing and drawing conclusions from it. National sample surveys and census can be taken as the best examples of descriptive research.

Types of descriptive research

- Survey studies:** descriptive research is equated with survey research. It is better to consider survey as one category of research under descriptive research
- Correlational studies:** the purpose of correlational studies is to explore whether there is any relationship or interdependence between two variables of characteristics, and to ascertain the degree of such relationship.

3. Explanatory Research: Explanatory research or causal research, is conducted to understand the impact of certain changes in existing standard procedures. Conducting experiments is the most popular form of casual research. For example, research conducted to understand the effect of rebranding on customer loyalty.

	Exploratory Research	Descriptive Research	Explanatory Research
Research approach used	Unstructured	Structured	Highly structured
Research conducted through	Asking research questions	Asking research questions	By using research hypotheses.
When is it conducted?	Early stages of decision making	Later stages of decision making	Later stages of decision making

Positivism: Positivism is a philosophical theory stating that certain ("positive") knowledge is based on natural phenomena and their properties and relations. Thus, information derived from sensory experience, interpreted through reason and logic, forms the exclusive source of all certain knowledge. Positivism holds that valid knowledge (certitude or truth) is found only in this a posteriori knowledge. Positivism asserts that all authentic knowledge allows verification and that all authentic knowledge assumes that the only valid knowledge is scientific.

Post-Positivist/ Post-Positivism: While positivists emphasize quantitative methods, post positivists consider both quantitative and qualitative methods to be valid approaches. Post positivism recognizes that the way scientists think and work and the way we think in our everyday life are not distinctly different. Scientific reasoning and common sense reasoning are essentially the same process. Post positivism recognizes that all observation is fallible and has error and that all theory is revisable. The goal of science is to hold steadily to the goal of getting it right about reality, even though we can never achieve that goal.

Robert Dubin describes the basic components of a post positivist theory as being composed of basic "units" or ideas and topics of interest, "laws of interactions" among the units, and a description of the "boundaries" for the theory. A post positivist theory also includes "empirical indicators" to connect the theory **to observable phenomena, and hypotheses that are testable using the scientific method.**

Positivism vs Postpositivism

Positivism is an **epistemological position** that holds that the goal of knowledge is simply to describe the phenomena that we experience. The purpose of science is sticking to what we can observe and measure. Knowledge of anything beyond that is impossible. In the positivist view, the universe is deterministic. It operates by laws of cause and effect that we could discern if we apply the unique approach of the scientific method. Science is largely a mechanical affair. The key approach of the scientific method is the experiment, the attempt to discern natural laws through direct manipulation and observation.

However, since the middle part of the **20th century** things have changed in our views of science. Probably the most important has been our shift away from positivism into what is called post-positivism. **Post-positivism recognizes** that the way scientists think and work and the way we think in our everyday life are not distinctly different. Scientific reasoning and common sense reasoning are essentially the same process. There is no difference in kind between the two, only a difference in degree. Post-positivism recognizes that all observation is fallible and has error and that all theory is revisable. Where the positivist believed that the goal of science was to uncover the truth, the post-positivist believes that the goal of science is to hold steadily to the goal of getting it right about reality, even though we can never achieve that goal.

ACTION RESEARCH:

Action research means **learning by doing**. Action research refers to a wide variety of evaluative, investigative and analytical research methods designed to diagnose problems or weaknesses and help researches to develop practical solutions to address them quickly and efficiently. It may also be applied to programs or educational techniques that are not necessarily experiencing any problems, but that researchers simply want to learn more about the techniques and improve their knowledge.

The term action research was coined during **1940 by KURT LEWIN**. He said if you want to know how things really are just try to change them.

Steps of research

To do a research one have to keep in mind the research goal and its purposes. The technique of research needs different tools and instrument for gathering the data. Following are the steps to do research:

- A. Select the topic of candidate interest.
- B. Exhaustive literature study
- C. Formulation of the problem
- D. Definition of the problem
- E. Create own method/ Algorithm
- F. Selection of the sample data
- G. Data Collection, Data Processing, and Analysis
- H. Correctly interpretation of the data
- I. Testing the Hypotheses; Answering the Research Questions
- J. Throwing of inferences or conclusions
- K. Reporting of the research done that means the research report

How to find the research problem

To find a good research problem, we must have to consider five factors to check whether the problem is researchable or not. The five factors are as follows.

1. All the existing problem in country or in the world, which don't have any known solution
2. Whether the solution can be obtained by using the statistical tools and techniques
3. There are lots of solutions available, but they are not yet tested physically
4. To conclude a solution, problem need scientific investigation.
5. Emergency needs or problems of the mankind where it demands research.

Hypothesis

A proposition that can be verified to determine its reality is a hypothesis. A hypothesis may be defined as a logically conjectured relationship between two or more variables, expressed in the form of a testable statement. Relationship is proposed by using a strong logical argumentation. This logical relationship may be part of theoretical framework of the study. For example,

- ✚ Officers in my organization have higher than average level of commitment (variable).
- ✚ Level of job commitment of the officers is associated with their level of efficiency.
- ✚ Level of job commitment of the officers is positively associated with their level of efficiency.
- ✚ The higher the level of job commitment of the officers the lower their level of absenteeism.

There are different types of hypothesis which are as follows:

1. Descriptive Hypothesis
2. Relational Hypothesis
3. Correlational hypotheses
4. Explanatory (causal) hypotheses
5. Null Hypothesis
6. Alternative Hypothesis
7. Research Hypothesis

Descriptive Hypothesis: Descriptive hypothesis contains only one variable thereby it is also called as univariate hypothesis. Descriptive hypotheses typically state the existence, size, form, or distribution of some variable.

Relational Hypothesis: These are the propositions that describe a relationship between two variables. The relationship could be non-directional or directional, positive or negative, causal or simply correlational. While stating the relationship between the two variables, if the terms of positive, negative, more than, or less than are used then such hypotheses are directional because the direction of the relationship between the variables (positive/negative) has been indicated. These hypotheses are relational as well as directional. The directional hypothesis is the one in which the direction of the relationship has been specified. Non-directional hypothesis is the one in which the direction of the association has not been specified. The relationship may be very strong but whether it is positive or negative has not been postulated.

Correlational hypotheses: It state merely that the variables occur together in some specified manner without implying that one causes the other. Such weak claims are often made when we believe that there are more basic causal forces that affect both variables. For example: Level of job commitment of the officers is positively associated with their level of efficiency.

Explanatory (causal) hypotheses: It imply the existence of, or a change in, one variable causes or leads to a change in the other variable. This brings in the notions of independent and the dependent

variables. So the independent variable may not be the sole reason for the existence of, or change in the dependent variable.

Null Hypothesis: It is used for testing the hypothesis formulated by the researcher. Researchers treat evidence that supports a hypothesis differently from the evidence that opposes it. They give negative evidence more importance than to the positive one. It is because the negative evidence tarnishes the hypothesis. It shows that the predictions made by the hypothesis are wrong. The null hypothesis simply states that there is no relationship between the variables or the relationship between the variables is “zero.” . That is how symbolically null hypothesis is denoted as H_0 . For example:

H_0 = There is no relationship between the level of job commitment and the level of efficiency. Or

H_0 = The relationship between level of job commitment and the level of efficiency is zero

Or the two variables are independent of each other. It does not take into consideration the direction of association (i.e. H_0 is non directional), which may be a second step in testing the hypothesis.

Alternative Hypothesis: The alternative (to the null) hypothesis simply states that there is a relationship between the variables under study. In our example it could be: there is a relationship between the level of job commitment and the level of efficiency. Not only there is an association between the two variables under study but also the relationship is perfect which is indicated by the number 1. Thereby the alternative hypothesis is symbolically denoted as H_1 . It can be written like this:

H_1 : There is a relationship between the level of job commitment of the officers and their level of efficiency.

Research Hypothesis: Research hypothesis is the actual hypothesis formulated by the researcher which may also suggest the nature of relationship i.e. the direction of relationship.

Steps of Research

Selecting Sample Design: Researchers usually draw conclusions about large groups by taking a sample. A sample is a subset of the population selected to represent the population as a whole. A representative sample should be an unbiased indication of what the population is like.

The factors affecting inferences drawn from a sample are

- 1. Sample size:** The larger the sample, the more is the accuracy.
- 2. Variation in population:** The greater the variation in population, the greater will be the uncertainty of outcome

Types of Sampling Techniques

• **Probability Sampling Techniques** - Each has an element of being included in the sample and are based on Random, Systematic, Stratified, Cluster/Area Sampling.

• **Non-Probability Sampling Techniques** - Based on Consciences Sampling, Judgment Sampling and Quota Sampling.

- 1. Simple Random Sampling:** Random sampling is one of the simplest forms of collecting data from the total population. Under random sampling, each member of the subset carries an equal opportunity of being chosen as a part of the sampling process. For example, the total workforce in organizations is 300 and to conduct a survey, a sample group of 30 employees is selected to do the

survey. In this case, the population is the total number of employees in the company and the sample group of 30 employees is the sample. Each member of the workforce has an equal opportunity of being chosen because all the employees which were chosen to be part of the survey were selected randomly. But, there is always a possibility that the group or the sample does not represent the population as a whole, in that case, any random variation is termed as a sampling error.

2. Stratified Random Sampling: This method is used when units of the universe are Heterogeneous rather than homogeneous. Under this method, first of all units of the population are divided into different strata in accordance with their characteristics. Therefore by using random sampling, sample items are selected from each stratum. For example, if 150 students are to be selected out of 1500 students of a college, then firstly the college students will be divided into three groups on the basis of Arts, Commerce & science. Suppose there are 500, 700, 300 students respectively in three faculties & 10% sample is to be taken, then on the basis of random sampling 50, 70, & 30 students respectively will be selected by using random sampling. Thus, this method assumes equal representation to each class or group & all the units of the universe get equal chance of being selected in the sample.

3. Systematic Random Sampling: In this method, all the items of the universe are systematically arranged and numbered and then sample units are selected at equal intervals. For example, if 5 out of 50 students are to be selected for a sample, then 50 students would be numbered and systematically arranged. One item of the 1st 10 would be selected at random. Subsequently, every 10th item from the selected number will be selected to frame a sample. If the 1st selected number is 5th item, then the subsequent numbers would be 15th, 25th, 35th, & 45th.

4. Multistage Random Sampling: When sampling procedure passes through many stages, then it is known as multi-stage sampling. In this method, firstly the entire universe or population is divided into stages or sub-stages. From the each stage some units are selected on random sampling basis. Thereafter these units are subdivided and on the basis of random sampling again some sub-units are selected. Thus, this goes on with sub-division further and selection on. For example, If the government wants to take a sample of 10,000 households residing in Gujarat state. At the first stage, the state can be divided into the number districts, and then few districts can be selected randomly. At the second-stage, the chosen districts can be further sub-divided into the number of villages and then the sample of few villages can be taken at random. Now at the third-stage, the desired number of households can be selected from the villages chosen at the second stage. Thus, at each stage the size of the sample has become smaller and the research study has become more precise.

5. Cluster Sampling: It is also known as area sampling, In this type of sampling we make groups out of heterogeneous data and then select the groups randomly. In other words, in cluster sampling the universe is divided into many groups called cluster & out of which a few clusters are selected on random basis & then the clusters are complete enumerated. This method is usually applied in industries like as in pharmaceutical industry, a machine produces medicines tablets in the batches of hundred each, and then for quality inspection, a few randomly selected batches are examined.

A. Non-Probability Sampling Methods: Non-probability sampling methods are those methods in which selection of the units is made on the basis of **convenience or judgment** of the investigator rather than on the basis of probability or chance. In such methods, selection of units is made in accordance with the specific objectives & convenience of the investigator.

1. Judgment Sampling: In this type of sampling we collect our sample on the basis of experience, expert knowledge and accordingly to judge. For example, if a sample of 20 students is to be selected from a class of 80 students for analyzing the spending habits of the 10 students, the investigator would select 20 students, who in his opinion are representative of the class.

2. Quota Sampling: In this type of sampling quota is fixed for every enumerators and they have to collect the sample by using any biased method. In other words, the investigator are assigned definite quotas according to some criteria. They are instructed to obtain the required number to fill in each quota. The investigators select the individuals to collect information on their personal judgments within the quotas. When all or part of the whole quota is not available, the quota is completed by supplementing new responds. Quota sampling is a type of judgment sampling.

3. Convenience sampling: It is also known as **Chunk Sampling, Incidental Sampling** and in this type of sampling we get the sample in a convenient way from collections and guidance. For example, a book publisher selects some teachers conveniently on the basis of the list of the teachers from the college prospectus & gets feedback from them regarding his publication. This method is less expensive & more sample but is unscientific & unreliable. This method results in more dependence on the enumerators. This method is appropriate for sample selection where the universe or population is not clearly defined or list of the units is not available or sample units are not clear in themselves.

4. Extensive sampling: In this method, sample size is taken almost as big as the population itself like 90% the section of the population. Only those units are left out for which data collection is very difficult or almost impossible. Due to very large sample size, the method has greater level of accuracy.

SAMPLING & NON-SAMPLING ERRORS

The choice of a sample through may be made with utmost care, involves certain errors which may be classified into two types:

✚ Sampling Errors

✚ Non-Sampling Errors

These errors may occur in the collection, processing and analysis of data.

1. Sampling Errors: The Sampling Error refers to the statistical error occurred when the subset of the population (sample) deviates from the true characteristics, attributes and behavior of the total population. Simply, when the sample selected from the population differs from the actual attributes of the target population, then the sampling error arises.

Sampling errors arise primarily due to the following reasons:

- ✚ Faulty selection of the sampling methods.
- ✚ Substituting one sample for the sample due to the difficulties in collecting the sample.
- ✚ Faulty demarcation of sampling units.
- ✚ Variability of the population which has different characteristics.

2. Non-Sampling Errors: non-sampling errors are those which creep in due to human factors which always varies from one investigator to another. These errors arise due to any of the following factors:

- ✚ Faulty planning.
- ✚ Faulty selection of the sample units.
- ✚ Lack of trained & experienced staff which collect data.
- ✚ Errors due to wrong statistical measures.
- ✚ Framing of a wrong questionnaire.

DISSERTATION OR THESIS

A **thesis** or **dissertation** is a document submitted in support of candidature for an academic degree or professional qualification presenting the author's research and findings. The term graduate thesis is sometimes used to refer to both master's theses and doctoral dissertations. In short, a dissertation

or thesis [is a document submitted in support of candidature for an academic degree or professional qualification presenting the author's research and findings.

Providing references and citations is an important and essential part of any type of academic writing. The main purpose is to acknowledge the original source of ideas and work that is not the author's own, and to direct the readers to the original sources of information. Whenever you use sources such as books, journals, research papers, web sites, e-resources and others in the writings, one must give credit to the original author by properly citing the sources.

There are a number of different reference and citation styles available. Styles are basically well established practices and conventions. Depending on the discipline in which one is working and also the widely used style in the respective discipline, one can decide to select and use a particular style.

APA Reference Style: The APA reference style (named after the American Psychological Association) goes back to the late 1920s, when a group of scholars from the fields of Psychology, Anthropology and Business Management met in order to set up a system for giving references. Today, APA is used within the Social Sciences, as well as within other academic fields. The APA format for book entries in the Reference list looks like this: Author's last name, Initial(s). (Year of Publication). Title of book. Place of publication: Publisher. APA is an author-date reference style.

Harvard Reference style: Most reference styles are based on manuals published by scholarly associations or by publishing companies. This is not the case with Harvard, and, consequently, there are not one but several versions of Harvard style. The differences between the different versions are small and mainly concern the use of punctuation. It is an author-date referencing style.

MLA Reference Style: MLA (Modern Language Association) Style is widely used in the humanities, especially in writing on language and literature. MLA style uses brief parenthetical citations in the text that refer to an alphabetical list of works cited appearing at the end of the work. MLA Style is generally used by disciplines in the humanities, including: English Literatures Art Philosophy.

WHY WRITE A THESIS?

- It is the contribution you make to the academic community
- In the process, you will learn.

WHO SELECTS THE THESIS TOPIC GUIDE OR STUDENT?

On many occasions guide suggest some topics with better understanding, knowing very well the facilities available in the Laboratory / Hospitals. The student has also important role in accepting what has been suggested,

Impracticable outdated ideas of guides is catastrophic both to the students and to the department.

WHAT IS A THESIS STATEMENT?

- A thesis statement is a sentence used in an essay that serves as the guide for the essay and directly answers the question or task asked of you.
- A thesis statement express the main idea of your paper.

APART FROM THE SECTIONS FROM START TO END A THESIS MAY HAVE:

- ❖ The Title page
- ❖ An inscription/dedication
- ❖ Certificate

- ❖ Declaration
- ❖ Acknowledgments
- ❖ Abstract
- ❖ The contents page (including the contents of Appendices)
- ❖ Introduction
- ❖ Aims (and Objectives)
- ❖ A review of the relevant literature
- ❖ Methods (or Materials, and another Section for Methods, or Materials and Methods *****)
- ❖ Results, including Tables, Figures
- ❖ Discussion
- ❖ Summary
- ❖ References
- ❖ Appendices – usually 2: *****

- **Appendix A:** Materials used in testing

- **Appendix B:** Original Data which could also include computer printouts of waveforms, graphs...

Inscriptions/ Dedications:

This is, of course, optional and depends on the candidate. As far as possible a dedication or inscription should not be corrected or modified. However it is necessary to check that there are no obvious grammatical/spelling errors or that a quotation is not misquoted Certificate & Declaration – the format are standardized.

ACKNOWLEDGMENTS.... It is very important to be clear who may be acknowledged when writing a thesis – as compared to compiling a manuscript...

OBVIOUS INCLUSIONS:

- Guides, Dissertation committee members
- Assistance received for laboratory tests, statistical analysis, compilation, library searches
- Sources of funding both Institutional (to be mentioned in all cases), other funds
- Family and friends

REVIEW OF THE RELEVANT LITERATURE

This Section should contain relevant references from:

1. Traditional texts (ending with a clear link to experimental research)
2. Early publications (e.g., books, Indexed Journals)
3. Recent publications – preferably publications, also books
4. Tabulate the most relevant references at the end of the Section

RESULTS

- ❖ This main Section should be very concise
- ❖ It should include – what was found – mentioning the level of significance and other information considered relevant depending on the test used

- ❖ Mention the effect size
- ❖ Tables
- ❖ Graphs
- ❖ Information in Tables & Graphs should NOT duplicate each other

PRESENTED WELL

- ❖ Titles, sub-titles, sub-sub-titles (differences in case, font size, bold/underlined/italics, centered or indented or not indented)
- ❖ Indentation, line spacing
- ❖ Fonts (thesis-writers should be discouraged from using fonts other than Times NR/ Arial); Font size 12, 14
- ❖ Bold/Italics/Underlined
- ❖ Using the customary sections, using the appropriate terms (for e.g., references rather than bibliography)

Computers in Research

The computers are indispensable throughout the research process. The role of computer becomes more important when the research is on a large sample. Data can be stored in computers for immediate use or can be stored in auxiliary memories like floppy discs, compact discs, universal serial buses (pen drives) or memory cards, so that the same can be retrieved later. The computers assist the researcher throughout different phases of research process.

Phases of Research Process

There are five major phases of the research process. They are:

- 1) Conceptual phase
- 2) Design and planning phase
- 3) Empirical phase
- 4) Analytic phase and
- 5) Dissemination phase

1) Role of Computer in Conceptual Phase: The conceptual phase consists of formulation of research problem, review of literature, theoretical frame work and formulation of hypothesis. Role of Computers in Literature Review: Computers help for searching the literatures (for review of literature) and bibliographic references stored in the electronic databases of the world wide webs. It can thus be used for storing relevant published articles to be retrieved whenever needed. This has the advantage over searching the literatures in the form of books, journals and other newsletters at the libraries which consume considerable amount of time and effort.

2) Role of Computers in Design and planning phase: Design and planning phase consist of research design, population, research variables, sampling plan, reviewing research plan and pilot study. Role of Computers for Sample Size Calculation: Several software's are available to calculate the sample size required for a proposed study. NCSS-PASSGESS is such software. The standard deviation of the data from the pilot study is required for the sample size calculation.

3) Role of Computers in Empirical phase: Empirical phase consist of collecting and preparing the data for analysis. Data Storage: The data obtained from the subjects are stored in computers as word files or excel spread sheets. This has the advantage of making necessary corrections or editing

the whole layout of the tables if needed, which is impossible or time consuming in case of writing in papers. Thus, computers help in data entry, data editing, data management including follow up actions etc. Computers also allow for greater flexibility in recording the data while they are collected as well as greater ease during the analysis of these data.

In research studies, the preparation and inputting data is the most labor intensive and time consuming aspect of the work. Typically the data will be initially recorded on a questionnaire or record form suitable for its acceptance by the computer. To do this the researcher in conjunction with the statistician and the programmer, will convert the data into Microsoft word file or excel spreadsheet. These spreadsheets can be directly opened with statistical software's for analysis.

4) Role of Computers in Data Analysis: This phase consist of statistical analysis of the data and interpretation of results. Data Analysis: Many software's are now available to perform the 'mathematical part' of the research process i.e. the calculations using various statistical methods.

Software's like **SPSS**, **NCSS-PASS**, **STATA** and **Sysat** are some of the widely used. They can be like calculating the sample size for a proposed study, hypothesis testing and calculating the power of the study. Familiarity with any one package will suffice to carry out the most intricate statistical analyses. Computers are useful not only for statistical analyses, but also to monitor the accuracy and completeness of the data as they are collected.

5) Role of Computers in Research Dissemination This phase is the publication of the research study. Research publishing: The research article is typed in word format and converted to portable data format (PDF) and stored and/or published in the World Wide Web.

RESEARCH IN ETHICS

Ethics are the principles and guidelines that help us to uphold the things we value. Moral principles that govern a person's behavior or the conducting of an activity. Ethics and law are different aspects, although laws of the land are intended to be based on certain ethics. Ethics aim to achieve two fundamental objectives that is to tell us how we ought to act in a given situation and to provide us with strong reasons for doing so.

Main Approaches to Research Ethics

1. **Deontological approach:** we should identify and use a universal code in making ethical decisions. This is an absolutist approach.
2. **Ethical skepticism approach:** it states that ethical standards are not universal but are relative to one's own particular culture and time. This is based on relativism.
3. **Utilitarianism approach:** decisions regarding ethics in research should be based on an examination and comparison of the costs and benefits that may arise from a study.

Ethical issues relating to the researchers

1. Avoiding bias: objectivity in research means to avoid bias in the research process as it is considered unethical. Bias means deliberate attempt to either hide facts or to under represent or over represent them.
2. Provision or deprivation of a treatment: this is specifically true in case of medical research. Is it ethical to provide to a study population with an intervention or treatment that has not yet been conclusively proven effective? Thus, it imposes an ethical dilemma before researchers.
3. Incorrect reporting: this can be done to advance the interests of the researcher.

Some of the key terms used in the context of ethical issues concerning researchers are as follows:

1. **Fabricating behavior:** creation of spurious data by researcher, their recording and drawing inferences.
2. **Falsification:** it manipulates the research material, equipment and processes or changes or omits data or results such that the research is not accurately represented in the research records.
3. **Plagiarism:** it is the act of appropriating somebody else's ideas, thoughts, pictures, theories, words or stories as your own. If a researcher plagiarizes the work of others, the integrity, ethics and trustworthiness of the sum total of his or her research becomes questionable. Plagiarism is both an illegal and punishable act and is considered to be on the same level as stealing from the author who originally created it.
4. **Multiple authorship:** there can be many improprieties in authorship. Improper assignment of credit, such as excluding other authors, inclusion of other as authors who have not made a definite contribution towards the work publication without the knowledge of all the authors.

Thesis v/s Articles

- ❖ The purpose of thesis is education as it shows how much a person knows. The purpose of article is to advancement so enhance credibility and contribution in the field.
- ❖ In thesis, educational committee and professors to decide whether a person is worthy of degree. In article, here person may look up to become a scientist or further researcher.

POINTS TO REMEMBER

Ibid is the abbreviation for the Latin **ibidem**, meaning, the same. It refers to the same author and source (e.g., book and journal) in the immediately preceding reference.

op. cit. is the abbreviation for the Latin **opus citatum**, meaning the work cited. It refers to the reference listed earlier by the same author.

Loc. cit. is of Latin origin and abbreviation for **loco citato**, meaning in the place cited. It is a footnote or endnote term used to repeat the title and page number for a given work.

et al. refers to, and others; it is used when referring to a number of people.

Symposium: It is usually a formal meeting at which specialists deliver short addresses on a topic or on related topics and then answer the questions relating to these topics. It is especially one in which the participants form an audience and make presentations. Symposium is also defined as a collection of writings on a particular topic, as in a magazine.

Colloquium: It is usually an academic meeting at which specialists deliver addresses on a topic or on related topics and then answer the questions relating to these topics. A colloquium is targeted to a well-educated but not specialized audience.

Impact factor: the impact factor of an academic journal is a measure reflecting the average number of citations to recent articles published in the journal. It reflects the relative importance of a journal within its field. The journal with higher impact factors are deemed to be more important than those with lower ones.

EXPECTED MCQs

1. **Epistemology refers to**
 - a. A term specifically used in the social sciences
 - b. A term used to study the types of diseases.

- c. Acceptable level of knowledge in a field of study.
- d. A type of interviewing technique.

Answer: c

2. Which of the following term explains the idea that knowledge comes from experience?

- a. Rationalism
- b. Empiricism
- c. Logic
- d. Deduction

Answer: b

3. In every field, research pursuits promote systematic and gradual advancement of knowledge but discoveries are rare because

- a. Result is continuous critical investigation.
- b. It is not common to be able to think beyond a grooved channel.
- c. Sustained experimental work needed for discovery is not easily forthcoming.
- d. Most people lack the depth of knowledge needed for it.

Answer: d

4. Metaphysics means means

- a. A branch of physics
- b. Exploring the nature of ultimate reality
- c. Physics of metals
- d. Physics of weather

Answer: b

5. Which of the following statements is not correct?

- a. A researcher is expected to be a well-read person
- b. One researcher gives birth to another research
- c. All researchers contribute to existing knowledge
- d. A good researcher is a nice person.

Answer: d

6. The quality of research is judged by the

- a. Relevance of research
- b. Methodology adopted in conducting the research
- c. Depth of research
- d. Experience of researcher

Answer: b

7. One of the following is not a quality of researcher?

- a. Unison with that of which he is in search.
- b. He must be of alert mind.
- c. Keenness in enquiry.
- d. His assertion to outstrip the evidence.

Answer: a

8. Which of the following options are the main tasks of research in modern society?

- I. To keep pace with the advancement in the knowledge.
- II. To discover new things
- III. To write a critique on the earlier writings

IV.To systematically examine and critically analyze the investigations or sources with objectivity.

- a. IV, II, & I c. I & III
b. I, II & III d. II, III & IV

Answer: a

9. Which of following description is true in context of defining theory?

- a. An organized body of concepts and principles intended to explain a particular phenomenon.
- b. Tentative explanations that new data either support or do not support.
- c. Apt to drive further research.
- d. None of the above.

Answer: a

10. Research can be conducted by a person who

- Has studied research methodology
- Holds a postgraduate degree
- Possesses thinking and reasoning ability
- Is a hard worker.

Answer: c

11. Empirical research in social sciences is associated with

- a. Fictional narratives
- b. Positivist philosophy
- c. Historical artifacts
- d. Religious practices

Answer: b

12. The characteristics of scientific method of research are

- I.Empiricism
- II.Objectivity
- III.Systematic
- IV.Secretive
- V.Security related
- VI.Predictive

Options:

- a. I, II, III, & IV c. IV, V, VI, 1
b. I, II, IV & V d. III, IV, V, VI

Answer: a

13. In which of the following research paradigms the focus of concern is on interpreting reality in terms of participant's perspective.

- i. Experimental research
- ii. Ex-post facts research
- iii. Ethnographic research
- iv. Survey research

Options:

- a. I b. ii c. iii d. iv

Answer: c

14. There are two sets given below:

Set-I specifies the types of research, while Set-II indicates their characterizes. Match the two and given your answer by selecting the appropriate code:

Set-I (Research Types)

- a. Fundamental research
- b. Applied research
- c. Action research
- d. Evaluative research

Set-II (Characteristics)

- i. Finding out the extent of perceived impact of an intervention.
- ii. Developing an effective explanation through theory building.
- iii. Improving an existing situation through use of interventions.
- iv. Exploring the possibility of a theory for use in various situations.
- v. Enriching technological resources.

	A	B	C	D
a.	ii	iv	iii	i
b.	v	iv	iii	ii
c.	iii	ii	v	iv
d.	ii	iii	iv	v

Answer: A

15. Which of the following research types focuses on ameliorating the prevailing situations?

- a. Fundamental research
- b. Applied research
- c. Action research
- d. Experimental research

Answer: c

16. A researcher attempts to evaluate the effect of method of feeding on anxiety-proneness of children. Which method of research would be appropriate for this?

- a. Case study method.
- b. Experimental method
- c. Ex-post-facto method
- d. Survey method

Answer: c

17. The principal of a school conducts an interview session of teachers and students with a view to explore the possibility of their enhanced participation in school programmes. Which type of research does this endeavor be related to?

- a. Evaluation research
- b. Fundamental research
- c. Action research
- d. Applied research

Answer: c

18. In doing action research, what is the usual sequence of steps?

- Reflect, observe, plan, act
- Plan, act, observe, reflect
- Plan, reflect, observe, act
- Act, observe, plan, reflect

Answer: b

19. The following are two sets, such as research methods (set-I) and data collection tools (set-II). Match the two sets and indicate your answer by selecting the correct code.

Set-I

Set-II

- | | |
|------------------------------|------------------------------------|
| A. Experimental method | i. using primary secondary sources |
| B. Ex-post-facto method | ii. Questionnaire |
| C. Descriptive survey method | iii. Standardized tests |
| D. Historical method | iv. Typical characteristics tests. |

Codes:

- | | A | B | C | D |
|----|-----|-----|-----|----|
| A | ii | I | iii | iv |
| b. | iii | iv | ii | i |
| c. | ii | iii | I | iv |
| d. | ii | iv | iii | i |

Answer: b

20. The issue of research ethics may be considered pertinent at which stage of research?

- At the stage of problem formulation & its definition.
- At the stage of defining the population of research.
- At the stage of data collection and interpretation
- At the stage of reporting the findings.

Answer: c

21. The research antagonistic to ex-post facto research is

- Experimental studies
- Library researches
- Normative researches
- all of the above

Answer: a

22. Below are given some probable characteristics of an ineffective teacher, which of them is most likely to be characterized the ineffective teacher

- Emphasis upon pupil discussion in the clarification of group's goals.
- Emphasis upon standards.

- (c) Emphasis upon the control of the immediate situation
- (d) None of the above.

Answer: c

23. All cause non sampling errors except

- (a) Faulty tools of measurement
- (b) Inadequate sample
- (c) Defect in data collection
- (d) Non response

Answer: b

24. Formulation of hypothesis may not be necessary in

- (a) Survey studies
- (b) Fact finding (historical) studies
- (c) Experimental studies
- (d) Normative studies

Answer: b

25. For doing external criticism (for establishing the authenticity of data) a researcher must verify

- (a) The signature and handwriting of the author
- (b) The paper and ink used in that period which is under study
- (c) Style of prose writing of that period
- (d) all of the above

Answer: d

26. Survey study aims at

- (i) Knowing facts about the existing situation
 - (ii) Comparing the present status with the standard norms
 - (iii) Criticizing the existing situation
 - (iv) Identifying the means of improving the existing situation
- (a) (i) and (ii) only
 - (b) (i),(ii)and(iii)
 - (c) (i),(ii),(iii)and(iv)
 - (d) (ii) and (iii) only

Answer: b

27. The validity and reliability of a research will be at stake when

- (a) The incident was reported after a long period of time from that of its occurrence
- (b) The author who is the source of information is biased, incompetent or dishonest
- (c) The researcher himself is not competent enough to draw logical conclusions.
- (d) All of the above.

Answer: d

28. Seeing a very big turnout, it was reported that JD will win the election, the conclusion was based on

- (a) Random sampling

- (b) Cluster sampling
- (c) Purposive sampling
- (d) Systematic sampling

Answer: b

29. Which technique is generally followed when the population is finite?

- (a) Purposive sampling technique
- (b) Area sampling technique
- (c) Systematic sampling technique
- (d) None of the above

Answer: c

30. Which of the following is a non-probability sample?

- (a) Quota sample
- (b) Simple random sample
- (c) Purposive sample
- (d) (a) and (c) both

Answer: d

31. A researcher selects a probability sample of 100 out of the total population. It is

- (a) a cluster sample
- (b) a random sample
- (c) a systematic sample
- (d) a stratified sample

Answer: b

32. A good hypothesis should be

- (a) Formulated in such a way that it can be tested by the data
- (b) Precise, specific and consistent with most known facts
- (c) Of limited scope and should not have global significance
- (d) all of these

Answer: d

33. A researcher divides the populations into PG, graduates and 10+2 students and using the random digit table he selects some of them from each. This is technically called

- (a) Stratified sampling
- (b) Stratified random sampling
- (c) Representative sampling,
- (d) None of these

Answer: b

34. Action research means

- (A) A longitudinal research
- (B) An applied research
- (C) A research initiated to solve an immediate problem
- (D) A research with socioeconomic objective

Answer: c

35. In the process of conducting research 'Formulation of Hypothesis' is followed by

- (A) Statement of Objectives

- (B) Analysis of Data
- (C) Selection of Research Tools
- (D) Collection of Data

Answer: c

UNIT-3

READING COMPREHENSION

Reading Comprehension is the ability to read text, process it and understand its meaning. In addition, RCs are aimed at testing a candidate's Knowledge of two elements i.e. Vocabulary and Text Comprehension. And it is interesting to note that both these elements play a crucial role in better understanding of the passage i.e. for understanding a text, one must have better knowledge of Vocabulary. But what is more complex and varied out of the above two elements is the Text Comprehension.

The current trend of questions that come in the RC are inference based i.e. the questions are not direct but one has to infer from the given passage. Also there can be one or more conclusions given in the question which are true/false depending on what is asked in the question. Now let's move towards the Approach that one should follow while performing a RC in the exam. The most common suggestion and approach is first read the entire passage and then answer the question that follows. Firstly let's discuss this approach in detail.

Try to make notes while solving/ reading RCs. It is crucial for locating the appropriate information and also acts as a mental bookmark, thus helping in better understanding of the topic.

While making notes, one must look towards and identify following things:

- A. **Subject of the passage** – which/what is the precise thing the author, is talking about.
- B. **Main idea of the passage** – what the author is saying about the subject.
- C. **Tone of the author of the passage** – which is manner author has adopted in the passage.

As soon as one figure out the above three things and central point of the passage, one will be familiar with the gist (**GI – general Idea + S – Structure + T- Tone**) of the passage. This will also help you to build a thematic composition and logical sequence of the passage. Thus enable you to answer questions from particular parts of the passage.

But this sole approach is beneficial for the ones who generally read very fast. Then what approach should one follow in a RC, below are the some of the approaches that one must try.

1. Instead of reading the entire passage read critically the first and last paragraph of the RC. Generally what the author is saying can be identified in the first few lines of the passage, which in case of longer passages becomes roughly 1/3rd of the passage. For the rest passage examine hastily, what the author has said about the subject.

Also for longer passages, try to put down in 10-15 words, for each paragraph, what you feel are the central points of the passage.

2. The next thing in this approach is to identify the structural words that tell you the important Ideas or Transitions in a passage. These structural words play a specific role in a sentence and paragraph. The most common structural words are given below: These three kinds of words describe three roles that words can play in a paragraph.

For e.g.

Continuity words: The author would support his point of view further.

Contrast words: The author would introduce a contrarian point of view.

Conclusion words: The author would sum up his argument so far.

3. Further try to recognize the words that represent positive and negative role in the passage. These words will let you decide whether the author is for or against the subject. A few examples of such words are given below:

Thus these words help you establish the motive of the author.

4. Whenever a question is asked on a phrase given in the passage, just read the three lines above and below that phrase to have an idea of what is implicit from that phrase.

5. There are around 4-6 questions based on Synonyms and Antonyms, these questions can be answered if you have good vocabulary and if your vocabulary is not good, then read the sentence in which the word is used to get a rough idea of the meaning of the word. Now let's discuss how one should attempt Reading Comprehension (RC) questions in the Exam. Generally, there are 2 ways in which a RC can be attempted which are given below:

1. PQ Approach (passage first, then the questions)

Read the entire passage thoroughly first and then read the questions.

Skim & Scan through the passage and keep going back and forth with questions and passage

Read the first 2 paragraphs, scan all the questions and see what you can answer, then read Para 3 & 4, scan the questions and see what you can answer, then read Para 5 & 6!!

2. QP approach (questions first, then the passage)

Read all the questions with their answer options first and then the passage.

Read question 1 with all the options, then go through the entire passage to answer it. Then read question 2, go through the entire passage. Then question 3! Just read all the question stems, without reading the answer options. Then read the passage and try answering the questions by reading them with the options.

Reading Comprehension Practice Test 1

Passage For Question 1 to 9

"Most economists in the United states seem captivated by spell of the free market. Consequently, nothing seems good or normal that does not accord with the requirements of the free market. A price that is determined by the seller or for that matter, established by anyone other than the aggregate of consumers seems pernicious, accordingly, it requires a major act of will to think of price – fixing (the determination of prices by the seller) as both "normal" and having a valuable economic function. In fact, price-fixing is normal in all industrialized societies because the industrial system itself provides, as an effortless consequence of its own development, the price-fixing that requires, Modern industrial planning requires and rewards great size. Hence a comparatively small number of large firms will be competing for the same group of consumers. That each large firm will act with consideration of its own needs and thus avoid selling its products for more than its competitors charge is commonly recognized by advocates of free-markets economic theories. But each large firms will also act with full consideration of the needs that it has in common with the other large firms competing for the same customers. Each large firm will thus avoid significant price cutting, because price cutting would be prejudicial to the common interest in a stable demand for products. Most economists do not see price-fixing when it occurs because they expect it to be brought about by a number of explicit agreements among large firms; it is not. More over those economists who argue that allowing the free market to operate without interference is the most efficient method of establishing prices have not considered the economies of non-socialist countries other than the United States. These economies employ intentional price-fixing usually in an overt fashion. Formal price fixing by cartel and informal price fixing by agreements covering the members of an industry are common place. Were there something peculiarly efficient about the free market and inefficient about price fixing, the countries that have avoided the first and used the second would have suffered drastically in their economic development. There is no indication that they have. Socialist industry also works within a frame work of controlled prices. In early 1970's, the soviet union began

to give firms and industries some of the flexibility in adjusting prices that a more informal evolution has accorded the capitalist system. Economists in the United States have hailed the change as a return to the free market. But Soviet firms are no more subject to prices established by free market over which they exercise little influence than are capitalist firms.

Question 1

The primary purpose of the passage is to:

- A. Refute the theory that the free market plays a useful role in the development of industrialized societies.
- B. Suggest methods by which economists and members of the government of the United States can recognize and combat price-fixing by large firms.
- C. Explain the various ways in which industrialized societies can fix in order to stabilize the free market
- D. Argue that price-fixing, in one form or another, is an inevitable part of and benefit to the economy of any industrialized society.
- E. Analysis of free markets in different economies

Correct Answer: E

Question 2

The passage provides information that would answer which of the following questions about price-fixing?

- I. What are some of the ways in which prices can be fixed?
- II. For what products is price-fixing likely to be more profitable than the operation of the free market?
- III. Is price-fixing more common in socialist industrialized societies or in nonsocialist industrialized societies?

- A. I only
- B. III only
- C. I and II only
- D. II and III only
- E. I, II and III

Correct Answer : A

Question 3

The author's attitude toward "Most economists in the United States" can best be described as

- A. spiteful and envious
- B. scornful and denunciatory
- C. critical and condescending
- D. ambivalent but deferential
- E. uncertain but interested

Correct Answer : C

Question 4

It can be inferred from the author's argument that a price fixed by the seller "seems pernicious" because

- A. people do not have confidence in large firms
- B. people do not expect the government to regulate prices
- C. Most economists believe that consumers as a group should determine prices.

- D. Most economist's associate fixed prices with communist and socialist economies.
- E. Most economists believe that no one group should determine prices.

Correct Answer: C

Question 5

The suggestion in the passage that price-fixing in industrialized societies is normal arises from the author's statement that price-fixing is

- A. a profitable result of economic development
- B. an inevitable result of the industrial system
- C. The result of a number of carefully organized decisions.
- D. A phenomenon common to industrialized and to industrialized societies.
- E. A phenomenon best achieved cooperatively by government and industry.

Correct Answer: B

Question 6

According to the author, priced-fixing in no socialist countries is often.

- A. accidental but productive
- B. illegal but useful
- C. legal and innovative
- D. traditional and rigid
- E. Intentional and widespread.

Correct Answer: E

Question 7

According to the author, what is the result of the Soviet Union's change in economic policy in the 1970's?

- A. Soviet firms show greater profit
- B. Soviet firms have less control over the free market
- C. Soviet firms are able to abject to technological advances.
- D. Soviet firms have some authority to fix prices.
- E. Soviet firms are more responsive to the free market.

Correct Answer: D

Question 8

With which of the following statements regarding the behavior of large firms in industrialized societies would the author be most likely to agree.

- A. The directors of large firms will continue to anticipate the demand for products
- B. The directors of large firms are less interested in achieving a predictable level of profit than in achieving a large profit.
- C. The directors of large firms will strive to reduce the costs of their products.
- D. Many directors of large firms believe that the government should establish the prices that will be charged for products.
- E. Many directors of large firms believe that the price charged for products is likely to increase annually.

Correct Answer: A

Question 9

In the passage, the author is primarily concerned with

- A. predicting the consequences of a practice
- B. criticizing a point of view
- C. Calling attention to recent discoveries.
- D. Proposing a topic for research.
- E. Summarizing conflicting opinions.

Correct Answer: B

Passage For Question 10 to 15

The discoveries of the white dwarf, the neutron star, and the black hole, coming well after the discovery of the red giant are among the most exciting developments in decades because they may be well present physicists with their greatest challenge since the failure of classical mechanics. In the life cycle of the star, after all of the hydrogen and helium fuel has been burned, the delicate balance between the outer nuclear radiations. Pressure and the stable gravitational force becomes disturbed and slow contraction begins. As compression increases, a very dense plasma forms. If the initial star had mass of less than 1.4 solar masses (1.4 times the mass of our sun), the process ceases at the density of 1,000 tons per cubic inch, and the star becomes the white dwarf. However, if the star was originally more massive, the white dwarf plasma can't resist the gravitational pressures, and in rapid collapse, all nuclei of the star are converted to a gas of free neutrons. Gravitational attraction compresses this neutron gas rapidly until a density of 10 tons per cubic inch is reached; at this point the strong nuclear force resists further contraction. If the mass of the star was between 1.4 and a few solar masses, the process stops here, and we have a neutron star. But if the original star was more massive than a few solar masses, even the strong nuclear forces cannot resist the gravitational pressure. The neutrons are forced into one another to form heavier hadrons and these in turn coalesce to form heavier entities, of which we as yet know nothing. At this point, a complete collapse of the stellar mass occurs; existing theories predict a collapse to infinite density and infinitely small dimensions. Well before this, however, the surface gravitational force would become so strong that no signal could ever leave the star - any photon emitted would fall back under gravitational attraction - and the star would become black hole in space. This gravitational collapse poses a fundamental challenge to physics. When the most widely accepted theories predict such improbable things as infinite density and infinitely small dimensions, it simply means that we are missing some vital insight. This last happened in physics in the 1930's, when we faced the fundamental paradox concerning atomic structure. At that time, it was recognized that electrons moved in table orbits about nuclei in atoms. However, it was also recognized that if charge is accelerated, as it must be to remain in orbit, it radiates energy; so, theoretically, the electron would be expected eventually to spiral into the nucleus and destroy the atom. Studies centered on this paradox led to the development of quantum mechanics. It may well be that an equivalent advance awaits us in investigating the theoretical problems presented by the phenomenon of gravitational collapse.

Question 10

The primary purpose of the passage is to

- A. Offer new explanations for the collapse of stars.
- B. Explain the origins of black holes, neutron stars, and white dwarfs.
- C. Compare the structure of atoms with the structure of the solar system.
- D. Explain how the collapse of stars challenges accepted theories of physics.
- E. Describe the imbalance between radiation pressure and gravitational force.

Correct

Answer: D

Question 11

According to the passage, in the final stages of its development our own sun is likely to take the form of a

- A. white dwarf
- B. neutron star
- C. red giant
- D. gas of free neutrons
- E. black hole

Correct Answer: A

Question 12

According to the passage, an imbalance arises between nuclear radiation pressure and gravitational force in stars because

- A. the density of a star increases as it ages
- B. radiation pressure increases as a star increases in mass
- C. radiation pressure decreases when a star's fuel has been consumed
- D. the collapse of a star increases its gravitational force.
- E. a dense plasma decreases the star's gravitational force.

Correct Answer: C

Question 13

The author asserts that the discoveries of the white dwarf, the neutron star, and the black hole are significant because these discoveries.

- A. demonstrate the probability of infinite density and infinitely small dimensions
- B. pose the most comprehensive and fundamental problem faced by physicists in decades
- C. Clarify the paradox suggested by the collapse of electrons into atomic nuclei.
- D. Establish the relationship between the mass and gravitational pressure.
- E. Assist in establishing the age of the universe by tracing the life histories of stars.

Correct

Answer: B

Passage For Question 1 to 9

Recent years have brought minority-owned businesses in the United States unprecedented opportunities-as well as new and significant risks. Civil rights activists have long argued that one of the principal reasons why Blacks, Hispanics and the other minority groups have difficulty establishing themselves in business is that they lack access to the sizable orders and subcontracts that are generated by large companies. Now congress, in apparent agreement, has required by law that businesses awarded federal contracts of more than \$500,000 do their best to find minority subcontractors and record their efforts to do so on forms filed with the government. Indeed, some federal and local agencies have gone so far as to set specific percentage goals for apportioning parts of public works contracts to minority enterprises. Corporate response appears to have been substantial. According to figures collected in 1977, the total of corporate contracts with minority business rose from \$77 to \$1. 1 billion in 1977. The projected total of corporate contracts with minority business for the early 1980's is estimated to be over \$3 billion per year with no letup anticipated in the next decade. Promising as it is for minority businesses, this increased patronage poses dangers for them, too. First, minority firms risk expanding too fast and overextending

themselves financially, since most are small concerns and, unlike large businesses they often need to make substantial investments in new plants, staff, equipment, and the like in order to perform work subcontracted to them. If, thereafter, their subcontracts are for some reason reduced, such firms can face potentially crippling fixed expenses. The world of corporate purchasing can be frustrating for small entrepreneurs who get requests for elaborate formal estimates and bids. Both consume valuable time and resources and a small company's efforts must soon result in orders, or both the morale and the financial health of the business will suffer. A second risk is that White-owned companies may seek to cash in the increasing apportionments through formation of joint ventures with minority-owned concerns, of course, in many instances there are legitimate reasons for joint ventures; clearly, white and minority enterprises can team up to acquire business that neither could Third, a minority enterprise that secures the business of one large corporate customer often runs the danger of becoming – and remaining dependent. Even in the best of circumstances, fierce competition from larger, more established companies makes it difficult for small concerns to broaden their customer bases; when such firms have nearly guaranteed orders from a single corporate benefactor, they may truly have to struggle against complacency arising from their current success.

Question 1

The primary purpose of the passage is to:

- A. Present a commonplace idea and its inaccuracies
- B. Describe a situation and its potential drawbacks
- C. Propose a temporary solution to a problem
- D. Analyze a frequent source to a problem
- E. Explore the implications of findings.

Correct Answer: B

Question 2

The passage supplies information that would answer which of the following questions?

- A. What federal agencies have set percentage goals for the use of minority owned businesses in public works contracts?
- B. To which government's agencies must businesses awarded federal contracts report their efforts to find minority subcontractors?
- C. How widespread is the use of minority-owned concerns as "fronts; by White backers seeking to obtain subcontracts?
- D. How many more minority owned businesses were there in 1977 than in 1972?
- E. What is one set of conditions under which a small business might find itself financially overextended?
- F. Correct

Answer : E

Question 3

According to the passage, civil rights activists maintain that one disadvantage under which minority owned businesses have traditionally had to labor is that they have

- A. been specially vulnerable to governmental
- B. been denied bank loans at rates comparable to those afforded larger competitors
- C. not had sufficient opportunity to secure businesses created by large corporations
- D. not been able to advertise in those media that reach large numbers of potential customers
- E. Not had adequate representation in the centers of government power.

Answer : C

Question 4

The passage suggests that the failure of a large business to have its bids for subcontracts results quickly in order might cause it to:

- A. Experience frustrations but not serious financial harm
- B. Face potentially crippling fixed expenses
- C. Have to record its efforts on forms filed with the government
- D. Increase its spending with minority subcontractors
- E. Revise its procedure for making bids for federal contracts and subcontracts

Answer: A

Question 5

The authors implied that the minority owned concern that does the greater part of its business with one large corporate customer should

- A. Avoid competition with the larger, more established concerns by not expanding
- B. Concentrate on securing even more business from that corporation
- C. Try to expands its customers base to avoid becoming dependent on the corporation
- D. Pass on some of the work to be done for the corporation to other minority owned concerns.
- E. Use its influence with the other corporation to promote subcontracting with other minority concerns.

Answer : C

Question 6

It can be inferred from the passage that, compared with the requirements of law, the percentage goals set by "some federal and local agencies" are

- A. More popular with large corporations
- B. More specific
- C. Less controversial
- D. Less expensive to enforce
- E. Easier to comply with

Answer : B

Question 7

Which of the following if true, would most weaken the author's assertion that, in 1970's, corporate response to federal requirements (lines 18-19) was substantial?

- A. Corporate contracts with minority owned business totaled about \$2 billion in 1979
- B. Between 1970 and 1972, corporate contracts with minority owned businesses declined by 25 percent
- C. The figures collected 1977 underrepresented the extent of corporate contracts with minority owned businesses.
- D. The estimate of corporate spending with minority owned businesses in 1980 is approximately \$10 million too high
- E. The \$1.1 billion represented the same percentage of total corporate spending in 1977 as did \$77 million in 1972.

Answer : E

Question 8

The passage most likely appeared in:

- A. A business magazine
- B. An encyclopedia of black history to 1945
- C. A dictionary of financial terms
- D. A yearbook of business statistics
- E. An accounting textbook

Answer : A

Question 9

The author would most likely agree with which of the following statements about corporate response to working with minority subcontractors?

- A. Annoyed by the proliferations of “front” organizations, corporate are likely to reduce their efforts to work with minority owned subcontractors in the near future.
- B. Although corporations showed considerable interest in working with minority businesses in the 1970’s their aversion to government paperwork made them reluctant to pursue many government contracts.
- C. The significant response of corporation in the 1970’s is likely to be sustained and conceivably be increased throughout the 1980’s
- D. Although corporations re eager to co-operate with minority owned businesses, a shortage of capital in the 1970’s made substantial response impossible.
- E. The enormous corporate response has all but eliminated the dangers of over expansion that used to plague small minority owned businesses.

Answer : C

Passage For Question 10 to 15

In strongly territorial birds such as the indigo bunting, song is the main mechanism for securing g, defining, and defending an adequate breeding are. When population density is high, only the strongest males can retain a suitable area. The weakest males do not breed or are forced to nest on poor or marginal territories. During the breeding season, the male indigo bunting sings in his territory; each song lasts two or three seconds with a very short pause between songs, Melodic and rhythmic characteristics are produced by rapid changes in sound frequency and some regularity of silent periods between sounds. These modulated sounds form recognizable units, called figures, each of which is reproduced again and again with remarkable consistency. Despite the large frequency range of these sounds and the rapid frequency changes that the birds makes, the n umber of figures is very limited. Further, although we found some unique figures in different geographical populations, more than 90 percent of all Indigo bunting figures are extremely stable on the geographic basis. In our studies of isolated buntings we found that male indigo buntings are capable of singing many more types of figures than they usually do. Thus, it would seem that they copy their figures from other buntings they hear signing. Realizing that the ability to distinguish the songs of one species from those of another could be an important factor in the volition of the figures, we tested species recognition of a song. When we played a tape recording of a lazuli bunting or a painted bunting, male indigo bunting did not respond; even when a dummy of male indigo bunting was placed near the tape recorder. Playing an indigo bunting song, however, usually brought an immediate response, making it clear that a male indigo bunting can readily distinguished songs of its own species from those of other species. The role of the songs figures in interspecies recognition was then examined. We created experimental songs composed of new figures by playing a normal song backwards, which changed the detailed forms of the figures without altering frequency ranges

or gross temporal features. Since the male indigos gave almost a full response to the backward song, we concluded that a wide range of figures shapes can evoke positive responses. It seems likely, therefore, that a specific configuration is not essential for interspecies recognition, but it is clear that song figures must confirm to a particular frequency range, must be within narrow limits of duration, and must be spaced at particular intervals. There is evident that new figures may arise within a population through a slow process of change and selection. This variety is probably a valuable adaptation for survival: if every bird sang only a few types of figures, in dense woods or underbrush a female might have difficulty recognizing her mate's song and a male might not be able to distinguish a neighbor from a stranger. Our studies led us to conclude that there must be a balance between song stability and conservatism, which lead to clear-cut species recognition, and song variation, which leads to individual recognition.

Question 10

The primary purpose of passage is to

- A. Raise new issues
- B. Explain an enigma
- C. Refute misconceptions
- D. Reconcile differing theories
- E. Analyze a phenomenon

Answer : E

Question 11

According to the passage, which of the following is true about the number and general nature of figures sung by the indigo bunting?

- A. They are established at birth
- B. They evolve slowly as the bird learns
- C. They are learned from other indigo buntings.
- D. They develop after the bird has been forced onto marginal breeding areas.
- E. The gradually develop through contact with prospective mates

Answer : C

Question 12

It can be inferred that the investigation that determined the similarity among more than 90 percent of all the figures produced by birds living in different regions was undertaken to answer which of the following questions?

- I. How much variations, if any, is there in the figure types produced by indigo buntings in different locales?
- II. Do local populations of indigo buntings develop their own dialects of figure types?
- III. Do figure similarities among indigo buntings decline with increasing geographic separation?

- A. II only
- B. III only
- C. I and II only
- D. II and III only
- E. I, II and III

Answer : E

Question 13

It can be inferred from the passage that the existence of only a limited number of indigo bunting figures serves primarily to:

- A. Ensure species survival by increasing competition among the fittest males for the females
- B. Increase population density by eliminating ambiguity in the figures to which the females must respond
- C. Maintain the integrity of the species by restricting the degree of figure variation and change
- D. Enhance species recognition by decreasing the number of figure patterns to which the bird must respond
- E. Avoid confusion between species by clearly demarcating the figure patterns of each species

Answer : D

Question 14

It can be inferred that a dummy of a male indigo bunting was placed near the tape recorder that played the songs of different species in order to try to

- A. Simulate the conditions in nature.
- B. Rule out visual cues as a factor in species recognition
- C. Supply an additional clue to species recognition for the indigo bunting
- D. Provide data on the habits of bunting species other than the indigo bunting
- E. Confound the indigo buntings in the experiment

Answer: B

Question 15

According to the passage, the authors played a normal indigo bunting song backwards in order to determine which of the following?

- A. What are the limits of the frequency range that will provide recognition by the indigo bunting.
- B. What is the time duration necessary for recognition by the indigo bunting?
- C. How specific must a figure shape be for it to be recognized by the indigo bunting?
- D. How does variation in the pacing of song figures?
- E. Is the indigo bunting responding to cues other than those in the song figures?

Answer: C

UNIT-4

COMMUNICATION

Communication is crucial for existence of human behavior. Some sociologists define **communication** as “the mechanism through which human relations exist and develop”. According to the **American Society of Training Directors**, a good communication is “the interchange of thought or information to bring about mutual understanding and confidence or good human relations”. **Mary Ellen Guffey** defines communication as “the transmission of information and meaning from one individual or group to another”. It should be noted that communication is anything which makes a message meaningful to the one being communicated with. Communication is a two-way process and is not complete without feedback. Feedback helps a communication to be an effective communication because feedback confirms receipt and adequate understanding of the intended message. Communication can be described as a process of information transmission by three rules:

- **Syntactic:** It means formal properties of signs and symbols
- **Pragmatic:** It is concerned with the relations between signs/expressions and their users
- **Semantic:** It is the study of relationships between signs and symbols and what they represent.

Nature and Characteristic of communication:-

1. **Communication is continuous;** It is not a random exercise, it is always with some purpose. It is predictable and dependable.
2. **Communication is all pervasive;** Communication is omnipresent: it exists at all levels of organizations. The top level conveys information to the middle level and vice versa. Similarly the middle level conveys information to the supervisory staff and vice versa. There is flow of communication in all directions in a workplace.
3. **Effective communication is a two way process;** Communication can occur only when there are at least two individuals.
4. **Communication is always with content and a relationship aspect;** Both in terms of (i) what you say and (ii) how you say the matter. Same message can be communicated authoritatively or politely.
5. **Communication exchanges are based on symmetry and complementary;** Symmetry refers to similarity and complementarity refers to the differences in characteristics.
6. **Common language;** To increase the possibility of effectual communication senders must speak in a language the receiver is familiar with.
7. **Communication always has a context;** Communication always takes place with a context. According to Bateson, without context, words and action don't carry any meaning at all. The context of communication has four dimensions:
 - a. **Social context;** It refers to the place where communication is taking place in public conference room, class room, etc. It may refer to the ambience of the place as well.
 - b. **Social context;** It refers to the parties involved in communication process. What role, status and relationship exist between them? What are the norms and the culture of the society in which they communicate?
 - c. **Psychological context;** Is the environment characterized by formality or informality, friendliness or unfriendliness.
 - d. **Temporal context;** It refers to the time factor in communication such as at what time of the day communication is taking place.

Elements in Basic communication Process:-

- 1. Source/sender:-** A person, thing or event that provides verbal or non-verbal clues to which someone can respond.
- 2. Receiver:-** A person who interprets a message sent by a source.
- 3. Message:-** A set of verbal or non-verbal cues sent by a source. Message can be spoken or written in words, gestures, movement, etc.
- 4. Symbols:-** A symbol is something that represents something else, it can be verbal or non-verbal.
- 5. Channel:-** A channel is the means used to convey stimuli. The most common channels are visual and auditory, and other channels utilize tactile (touch), gustatory (taste) and Olfactory (smell) senses.
- 6. Encoding:-** Encoding is the process of selecting symbols to express an idea or feeling that the source wishes to communicate.
- 7. Decoding:-** It is the process by which the receiver translates the symbols provided by the source.
- 8. Feedback:-** It is response a receiver gives to sender as a result of sender's message.
- 9. Noise:-** Noise is anything that distorts or interferes with the message; it can be external.

Process of classroom communication (Cole and Chan Model)

Communication is an integral part of any teaching learning process and its effectiveness is one of the factors that determine the degree to which the intended learning outcomes are achieved.

According to Cole and Chan, typical process of classroom communication (and communication in general as well) includes five distinct stages.

1. Formulations of message
2. Encoding of message
3. Transmission of message
4. Decoding and interpretation of message
5. Feedback and evaluation

Formulation of message:-

1. All communication starts with an idea or a message that is to be transmitted to target audience (individual) with a motive to get a positive response. Communicator (sender or encoder) is the one who initiates the communication process.
2. A message is a set of verbal or non-verbal cues sent by a source.
3. An effective communication depends on the communication skill, knowledge level and attitude of the communicator and how he/she desires to affect his/her receiver.
4. As far as teachers are concerned, they conceptualize ideas to be conveyed to student by arranging them in coherent and meaning full sequence.

Message Encoding:-

1. The internal shaping, sorting and sifting of ideas for clarification and organization is called message formulation. Its purpose is to create a clear and meaningful message.
2. Encoding involves converting an idea into a form that can be transmitted to receiver.
3. The communicator not only translates his/her purpose (ideas, thoughts or information) into a message but also decides on the medium to communicate his/her planned message.
4. The communicator must choose the media (speech, writing signaling, or gestures) that the receiver can comprehend well. For instance, an illiterate receiver may fail to understand a written message but can understand it well if told orally.
5. Teachers encode their ideas in different ways according to the demand of the various curricula. It is the teacher's responsibility to use appropriate symbolic forms for each subject and to teach student to use these forms.

Message Transmission:-

1. It is a critical stage in the communication process, and it answers how a message is delivered.

Message Decoding and interpretation:-

1. Decoding is interpretation of the message by the receiver. Actually the receiver looks for meaning in the message that is common to both the receiver and the communicator.
2. If the receiver possesses the background information and is familiar with the form of language used, it becomes easier for him/her to decode and comprehend the message.
3. If the receiver does not have the ability to listen read and think he/she will not be able to receive and decode the messages in the manner the communicator wants him/her to.
4. For effective communication the receiver is the most important link in the communication process.

Feedback and Evaluation:-

Feedback is the response or acknowledgement of the receiver to the communicator's message. The exchange is possible only if the receiver responds.

Noise:-

Noise is an interruption that can creep in at any point of time in the communication process and make it ineffective.

1. **Physiological noise:** It is distraction caused by hunger, fatigue, headache medication etc.
2. **Physical noise:** It is interference in our environment.
3. **Psychological noise:** It refers to the qualities in us that affect how we communicate and interpret other.
4. **Semantic noise:** It occurs when words themselves are not mutually understood.

Types of Communication

People communicate with each other in a number of ways that depend upon the message and its context in which it is being sent. Choice of communication channel and your style of communicating also affects communication. So, there are variety of types of communication.

Types of communication based on the communication channels used are:

Verbal Communication



Nonverbal Communication

Verbal Communication

Verbal communication refers to the form of communication in which message is transmitted verbally; communication is done by word of mouth and a piece of writing. Objective of every communication is to have people understand what we are trying to convey. In verbal communication remember the acronym KISS (keep it short and simple).

When we talk to others, we assume that others understand what we are saying because we know what we are saying. But this is not the case. Usually people bring their own attitude, perception, emotions and thoughts about the topic and hence creates barrier in delivering the right meaning.

So in order to deliver the right message, you must put yourself on the other side of the table and think from your receiver's point of view. Would he understand the message? how it would sound on the other side of the table?

Verbal Communication is further divided into:

Oral Communication



Written Communication

Oral Communication

In oral communication, Spoken words are used. It includes face-to-face conversations, speech, telephonic conversation, video, radio, television, voice over internet. In oral communication, communication is influence by pitch, volume, speed and clarity of speaking.

Advantages of Oral communication are:

- ✚ It brings quick feedback.
- ✚ In a face-to-face conversation, by reading facial expression and body language one can guess whether he/she should trust what's being said or not.

Disadvantage of oral communication

- ✚ In face-to-face discussion, user is unable to deeply think about what he is delivering, so this can be counted as a

Written Communication

In written communication, written signs or symbols are used to communicate. A written message may be printed or hand written. In written communication message can be transmitted via email, letter, report, memo etc. Message, in written communication, is influenced by the vocabulary & grammar used, writing style, precision and clarity of the language used.

Written Communication is most common form of communication being used in business. So, it is considered core among business skills.

Memos, reports, bulletins, job descriptions, employee manuals, and electronic mail are the types of written communication used for internal communication. For communicating with external environment in writing, electronic mail, Internet Web sites, letters, proposals, telegrams, faxes, postcards, contracts, advertisements, brochures, and news releases are used.

Advantages of written communication includes:

- ✚ Messages can be edited and revised many time before it is actually sent.
- ✚ Written communication provide record for every message sent and can be saved for later study.
- ✚ A written message enables receiver to fully understand it and send appropriate feedback.

Disadvantages of written communication includes:

- ✚ Unlike oral communication, written communication doesn't bring instant feedback.
- ✚ It take more time in composing a written message as compared to word-of-mouth. and number of people struggles for writing ability.

Nonverbal Communication

Nonverbal communication is the sending or receiving of wordless messages. We can say that communication other than oral and written, such as gesture, body language, posture, tone of voice or facial expressions, is called nonverbal communication. Nonverbal communication is all about the body language of speaker.

Nonverbal communication helps receiver in interpreting the message received. Often, nonverbal signals reflects the situation more accurately than verbal messages. Sometimes nonverbal response contradicts verbal communication and hence affect the effectiveness of message.

Nonverbal communication have the following three elements:

Appearance**Speaker:** clothing, hairstyle, neatness, use of cosmetics**Surrounding:** room size, lighting, decorations, furnishings**Body Language**

Facial expressions, gestures, postures

Sounds

Voice Tone, Volume, and Speech rate

Types of Communication Based on Purpose and Style

Based on style and purpose, there are two main categories of communication and they both bears their own characteristics. **Communication types based on style and purpose are:**

**Formal Communication****Informal Communication****Formal Communication**

In formal communication, certain rules, conventions and principles are followed while communicating message. Formal communication occurs in formal and official style. Usually professional settings, corporate meetings, conferences undergoes in formal pattern.

In formal communication, use of slang and foul language is avoided and correct pronunciation is required. Authority lines are needed to be followed in formal communication.

Informal Communication

Informal communication is done using channels that are in contrast with formal communication channels. It's just a casual talk. It is established for societal affiliations of members in an organization and face-to-face discussions. It happens among friends and family. In informal communication use of slang words, foul language is not restricted. Usually. Informal communication is done orally and using gestures.

Informal communication, unlike formal communication, doesn't follow authority lines. In an organization, it helps in finding out staff grievances as people express more when talking informally. Informal communication helps in building relationships.

Types of Communication on the Basis of Relationship Element:**Intrapersonal Communication:-**

1. It is communication within an individual almost all the times, including talking to one self-listening to oneself and relating one to oneself.

Muttering 'Oh My god' 'Oh No' (when in trouble), 'Wow' 'Thank God' are few common example of intrapersonal communication.

Interpersonal communication

1. It is also termed as dyadic communication.

2. It is universal form of face to face routine communication between two persons. Both sending and receiving messages.

3. It may be formal or informal, verbal or non-verbal.

4. It is an effective communication situation because you can get immediate feedback.

Group communication

1. It is an extension of interpersonal communication where more than two individual are involved in exchange or ideas, skills and interests.
2. It provides an opportunity for people to come together to discuss and exchange view of common interest.

Mass Communication

1. It is also termed as mediated communication.
2. It is a special kind of communication with mass audiences and hence the name mass communication.

Downward communication

In downward communication, communication is always flows from superiors to the subordinates. Downward flows of communication are the most common flow of communication in any organization. Following are the forms of downward communication.

- a) **Job instructions:** it is basically a direction about what to do and how to do it?
- b) **Procedures and practices:** it is the information about the rules and regulations, policies and benefits in any organization.
- c) **Feedback:** The manager can also provide information about how effective a subordinate is performing.

Upward communication

In any organization if the information goes from subordinates to superiors then it is known as upward communication. Upward communication is as important as the downward communication. Upward communication may take place in the following forms.

- a) Information of the subordinate about himself, his performance, his problems and grievances.
- b) Suggestion about what needs to be done and how it could be done.
- c) Report on what has been done.
- d) Information about other subordinates and their problems.
- e) Feedback about the subordinate and may include some of the issues listed above. What should be noted is that managers rely on upward communication for ideas and how things can be improved

Horizontal system of communication

Horizontal communication is also known as lateral communication. This type of communication happens between peoples works at the same or similar level in the organisation. **Horizontal communication serves five purposes:**

1. Task coordination
2. Problem-solving
3. Sharing information that will enhance employee's performance
4. Conflict resolution
5. Building a rapport among the employees

What Is Transpersonal Communication?

Transpersonal communication is defined by a core sense of individual awareness that extends to connect with elements of external environments. It is transcendent in its holistic approach towards bonding with multifaceted characteristics that surround both personal and universal spheres of existence.

The ability to establish interpersonal awareness within greater systems of space and time is essential to the notion that all social realms are connected through temporal union. Individual potential emerges from an understanding of explicit orders like external ecosystems, while implicit orders derive from connections between separate material elements. Other dimensions of communication

include the intra-personal, which examines connections between the mind with the soul, as well as inter-personal communication concepts that explore human dialogue.

MASS MEDIA

Mass usually means a large number. Mass has both positive and negative meaning. In socialist tradition, mass has a positive meaning. It connotes the strength and solidarity of ordinary working people when organized together for social and political ends. In the negative sense, mass refers to the ignorant and unruly mass that implies a lack of culture, intelligence and even of rationality.

Masses are geographically distributed. Very large number of people may attending a public meeting.

Mass media is a term used to denote, as a class that section of the media specifically conceived and designed to reach a very large audience, it may be typically at least a large group as a whole, or may be population of a nation state.

Mass media has some features:

1. The audience is large and heterogeneous: radio & television is assumed to have larger audience in comparison to newspaper.
2. The source is an institution or a group of people: for example, the ministry of information and broadcasting, government of India, is engaged in broadcasting television and radio programmes all over the country.
3. It is a special kind of communication with mass audiences and hence, the name is mass communication.
4. Examples of mass media are- radio, TV, newspaper, magazines and films. Recently internet, social media, blogging have also been added.

Objectives of Mass Media

1. Advocacy- for business and social issues such as advertising, marketing, propaganda, public relations and political communication.
2. Journalism- an activity of gathering, assessing, creating and presenting news and information.
3. Public relations- public relations is an art and science to build positive image of an organization.

Main theories of Mass media

1. **Hypodermic or bullet theory:** this theory reflects the fear or awe of mass media being used for massive propaganda. It happened during World War II when mass media was thought to have direct and powerful influence upon audiences. The audiences may be manipulated by media at will. The messages were thought to be like magic bullets that were shot directly into the receiver. It assumes that receivers are passive and defenseless and take whatever is shot at them.
2. **Psychological or individual difference theory:** this is psychological approach to understanding communication effects. Individual difference theory is one of them. Here, the different personality variables result in different reactions to the same stimuli. In other words, an individual's psychological mechanism accounts for his reactions to media messages. Here selective exposure and selective perceptions are important.

Selective exposure: selective exposure occurs when people tend to expose themselves selectively only to communications which are in general accordance with their established convictions and avoid communications which seem to challenge their beliefs.

Selective perception: once the individuals have selectively exposed themselves to the messages in accordance with their preferences, they tend to read into the message whatever suits their needs. This process is called selective perception.

3. **Sociological theories of mass communication:** the sociological approach to communication theory is based on the assumption that there exists a definite relationship between mass communication and social change.

Cultivation theory: this theory, developed by George Gerbner in 1967, it is based on the assumption that mass media have subtle effects on audiences who, unknowingly, absorb the dominant symbols, images and messages of media.

Agenda setting theory: set up by Maxwell and Donald, it is about voting during elections. Media are more successful in telling people “what is to think about” than in telling them “what to think”.

The uses and Gratification theory: this was set up by Katz. The uses approach assumes that audiences are active and willingly expose themselves to media. The uses of mass media are dependent on the perception, selectivity and previously held beliefs, values and interests of the people. The term Gratification refers to the rewards and satisfaction experienced by audiences after the use of media.

Dependency theory: this was proposed by Melvin De Fleur and Sandra Ball in which they recognize various psychological and social factors that prevent the media from exercising arbitrary control over their audiences.

4. **Normative theories of mass media:** normative theories explain how the media ought to or can be expected to operate under the prevailing set of political economic circumstances.

Authoritarian theory: the term was proposed by Siebert. It refers to an arrangement in which the press is subordinated to state power and the interests of a ruling class.

Free press theory: this theory, also called “Libertarian Theory”, is based on the fundamental right of an individual to freedom of expression, which is regarded as the main legitimating principle for print media in liberal democracies.

Social responsibility theory: this theory is as per recommendation of commission on freedom of press in USA. The free market has failed to fulfill certain obligations such as information, social and moral needs of the society.

Communist media theory: this theory is derived mainly from the basic tenets of Marx and Engels. It envisages media to be under the control of the working class whose interest they are meant to serve.

Development communication theory: this is mostly based on UNESCO report 1980. Press has limited application in four fields and communication is used to carry out development tasks in line with nationally established policy.

Mass society theory: according to Denis, this theory emphasizes the inter-dependence of institutions which exercise power in the society and mass media are deemed to be integrated into the sources of social power and authorities.

Important Points of Mass Media:

Gatekeepers: persons working in different mass media, having the responsibility of deciding what should get printed, broadcast or produced.

Entropy: the tendency of communication system to move from a state of order to disorder or chaos.

New wave: an experimental style of film making, popularized first in France, it is without any elaborate plot and chronological continuity and generally free from the ethicalities but there is an originality of treatment.

Prime time: the time during which the media have their largest audience.

Yellow journalism: it is a sensationalized story. It is a type of journalism that does not report much real news with facts. It uses shocking headlines that catch people's attention to sell more newspapers.

Alternative media: it is also a type of mass media. Alternative media use technology capable of reaching many people, even if the audience is often smaller than mainstream.

Participatory media: the means of production are widely available and content creation is not based on traditional editorial structures. Anyone with a cell phone camera and internet access can participate in the activity of journalism.

Surveillance: means the recording of an activity from the perspective of a participant in the activity. The participants possess small portable or wearable recording devices that often stream continuous live video to the internet.

Embedded journalist: these journalists are inserted into military units by the government.

Multimedia: a complex integrated and interactive system that has resulted in the seamless integration of data, text, images and sound within a single digital information environment.

Barriers to effective communication

Barriers in the communication may affect the understanding of the message by receiver or even distort the messages.

Barriers may arise at any stage of communication process.

1. At sender's level
2. At the encoding level
3. At the transmission level
4. At the receiver's level
5. At the feedback level

The main communication barriers are as follows:

Unclear objective

If the sender of the message is not clear about the objective of the message then this situation occurs. And dignity and the lack of clarity in the message creates communication breakdown because the receiver have two unlikely to respond as expected by the sender.

Choice of wrong medium

Communication breakdown may happen in the complication process if the choice of medium is not suitable. For example, if you want to post some important letter you must go for speed post. Once an appropriate medium is chosen, the effectiveness of the commutation process and the chances of eliciting the desired response are enhanced.

Wrong timing

Timing of the communication is also crucial for the success of communication process. For example, it is better to discuss the research process whenever your mind is stable. Communication process must be chosen at a time when there is a full concentration and thereby enhancing the effectiveness of the process.

Using bad words

The choice of words has great impact in the communication process. Suppose, the sender of the message choose the words which are too technical or too difficult for the receiver to understand. In this situation, the receiver cannot decode the message easily. Words that appear too easy or too simple may also constitute a problem. It is necessary, therefore, for the sender to be able to assess the receiver in order to be able to choose the most suitable words for the message. This way, the sender ensures that the message would achieve its goals.

Meaning of words

Whereas the sender may choose words with a certain and clear meaning in mind, the words in actual fact may connote some other meaning as far as the receiver is concerned. When this happens, the sender and the receiver are at cross purpose as they both have different meanings of the message. Connotative meaning can also arise as a result of one's experiences, opinions, emotional status and interests. In order to obtain shared meaning required for words used, the sender should analyse the message being sent to be able to determine what likely connotations could arise as a result of use of certain words.

Environmental factor

The environment within which, negation takes place also have great impact on the effectiveness of communication. For example, a telephone call from a crowded place or work from busy roadways is not clearly audible.

Capability of the receiver

Physical disabilities of recipient will have an obvious effect on the extent to which the recipient appreciates the intended meaning of a message. Hearing difficulties, for instance, are obvious situations that will constitute a barrier. It is important that the sender is able to take the receiver's capability into consideration in order to ensure effective communication.

Relationships

Relationships will, no doubt, affect the effectiveness of communication.

The 7 C's of communication

Completeness: The communication must be complete. It should convey all facts required by the audience. The sender of the message must take into consideration the receiver's mind set and convey the message accordingly.

Conciseness: Conciseness means wordiness, i.e, communicating what you want to convey in least possible words without forgoing the other C's of communication. Conciseness is a necessity for effective communication.

Consideration: Consideration implies "stepping into the shoes of others". Effective communication must take the audience into consideration, i.e, the audience's view points, background, mind-set, education level, etc. Make an attempt to envisage your audience, their requirements, emotions as well as problems. Ensure that the self-respect of the audience is maintained and their emotions are not at harm. Modify your words in message to suit the audience's needs while making your message complete.

Clarity: Clarity implies emphasizing on a specific message or goal at a time, rather than trying to achieve too much at once.

Concreteness: Concrete communication implies being particular and clear rather than fuzzy and general. Concreteness strengthens the confidence.

Courtesy: Courtesy in message implies the message should show the sender's expression as well as should respect the receiver. The sender of the message should be sincerely polite, judicious, reflective and enthusiastic.

Correctness: Correctness in communication implies that there are no grammatical errors in communication.

Theories and models of communication

Theory of Communication:

1. **Mechanistic:** the perfect transaction of a message from the sender to the receiver.
2. **Psychological:** the sending of a message to a receiver and emotions of the receiver upon interpreting the message.
3. **Social constructionist:** it sees the product of the interactants sharing and creating of meaning of message, while **transmission model** sees communication as robotic and computer like situation.

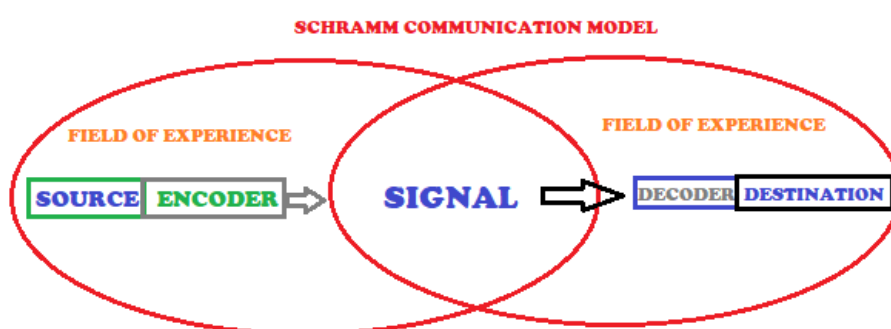
4. **Systemic:** the new messages created via through put or what happens as the message is being interpreted and reinterpreted as it travels through people.
5. **Critical:** a source of power and oppression of individuals and social groups. Inspection of a particular theory on this level will provide a framework on the nature of communication as seen within the confines of that theory.

MODELS OF COMMUNICATION

1. ARISTOTILE MODEL OF COMMUNICATION:

Aristotle model of communication includes three communication elements, such as speaker subject and audience. According to him, persuasion was a result of the influence that a speaker makes, he used discovery of the available means of persuasion for defining the whole art of persuasive communication.

Schramm in 1964 talked about the role of **field of experience** in his communication model.



Katz's in his **Intermediary model of communication** talks about the role of gatekeepers or intermediaries or censor groups. These gatekeepers have some ability to shape the organization through their selective sharing of information. **Katz talked about technical skills, human skills and conceptual skills in case of management.**

Shannon and Weaver in 1949 provided a visual mode of communication system in relation to electronic media popularly referred to as **Mathematical model of communication**. Shannon and Weaver talked about the three levels of problems in the communication of information. **The three levels are technical (signal), semantic (interpretation of meaning) and influential (effectiveness).**

Shannon and Weaver talked about the following concepts as well.

1. Entropy: the information can be measured by entropy that is one's degree of freedom of choice to select a message. The ration of the actual to the maximum entropy is called relative entropy.
2. Redundancy: the amount of information that can be eliminated or added communication in a noiseless channel, so that the message would still have meaning.
3. Channel capacity: the amount of information that can be transmitted per unit of time.

Helical Model of communication:

Frank Dance proposed a communication model inspired by helix in 1967, known as helical model of communication. A Helix is a three dimensional spring like curve in the shape of a cylinder or a cone. The model is linear as well as circular combined and disagrees with the concept of linearity and circularity individually.

Constitutive Metamodel:

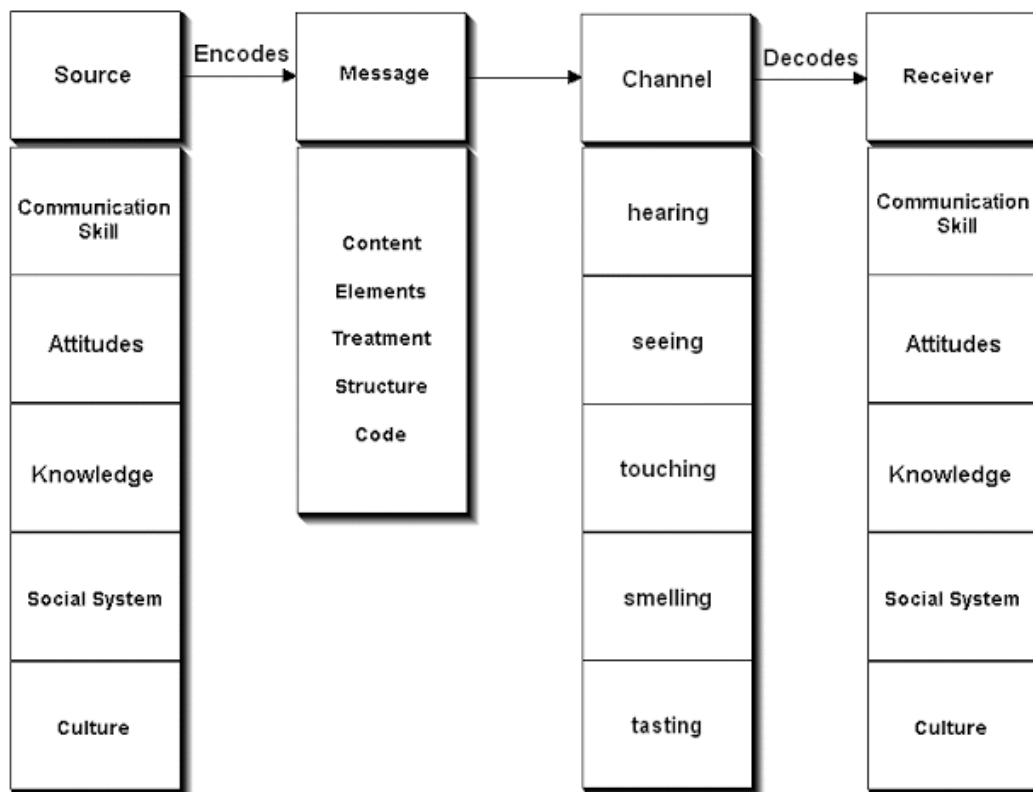
This is another way of dividing up the communication field. Craig proposes seven different traditions as listed below.

1. Rhetorical: the practical art of discourse.
2. Semiotic: the mediation by signs.
3. Phenomenological: the experience of dialogue with others.
4. Cybernetic: the main flow of information.
5. Socio-psychological: the interaction of individuals.
6. Socio-cultural: the production and reproduction of the social order.
7. Critical: as a process in which all assumptions can be challenged.

BERLOS MODEL OF COMMUNICATION

Berlo tried to explain communication as **S-R Model or Sender- Receiver model**, where **sender stands for stimulus and receiver stands for response**. This was later extended to **S M C R model that stands for Sender- Message- Channel- Receiver**. It is the basic communication process. It is a linear model of communication, there is no two way communication. There is no concept of feedback. There is no noise as well and no concept of barriers in communication.

Berlo's Model of Communication



A Source encodes a message for a channel to a receiver who decodes the message:
S-M-C-R Model.

Thill and Bovee Model: –

According to **Thill and Bovee** communication model, business communication is more than a single act. It is a chain of events consisting of five phases linking sender and receiver.

a). Idea: – The sender has an idea. In the process of conceiving an idea about the real world, the sender leaves out many things but assumes some things. This means idea in the mind of sender is a simplification of the real world.

b). Message: – The idea in the mind of sender is transformed into words and thus becomes a message. The message may be expressed in many ways.

c). Message is transmitted: – The 3rd step in the process is physical transmission of the message through verbal or non-verbal channel, from sender to receiver.

d). Receiver gets Message: – For communication to occur, the receiver has to get the message, and understand the message and store the message mentally.

e). Feedback: – The receiver reacts after receiving the message and sends feedback. Feedback is a key element in the communication process because it enables the sender to evaluate the effectiveness of the message. Then the process is repeated until both parties have finished expressing themselves.

Mass media model

Mass media means technology that is intended to reach a mass audience. It is the primary means of communication used to reach the vast majority of the general public. The most common platforms for mass media are newspapers, magazines, radio, television, and the Internet. The general public typically relies on the mass media to provide information regarding political issues, social issues, entertainment, and news in pop culture.

Attention-gaining Model or Attention model, is essential communicative activity of mass media to attract and keep attention. Communication has three models- Transmission, Expression/ Ritual and Attention-gaining.

The **transmission model** is mostly linked with institutional contexts such as education, religion and government. The **ritual model** shares some elements with the transmission model, but stresses more on external interpretation by observers than the stated purpose of receivers and senders. The **attention gaining model** comes closest to the main media goal of attracting audiences. It conflicts with the transmission model and ritual model as well.

POINTS TO REMEMBER:

MNEMONICS: This is somewhat in different context, mainly about learning and recalling of words, numbers, facts, etc. **Mnemonics** are memory devices that help learners recall larger pieces of information, especially in the form of lists like characteristics, steps, stages, parts, phases, etc. A study conducted by **Gerald R. Miller in 1967** found that mnemonics increased recall. Mnemonics can even be used to recall words or remember numbers.

Kinesics is a major form of non-verbal communication. It is defined as 'the study of nonlinguistic body movements such as facial expressions and gestures'. Kinesics is the interpretation of body language such as facial expressions and gestures or, more formally, non-verbal behavior related to body movement, either any part of the body or the body as a whole.

Paraphrasing is a skill that is absolutely necessary for good listening. It means stating in your own words, your understanding of what has just been said. It gives the speaker the opportunity to find out what message he/she is getting across to you. S/he can then make any corrections needed. To

begin paraphrasing, you might start by saying, 'What I hear you saying is' or 'It sounds like' or 'Let me see if I'm understanding you'

Kinesics communication: kinesics is a major form of non-verbal communication. It is defined as the study of non-linguistic body movements, such as facial expression and gestures. Kinesics is the interpretation of body language, such as facial expression and gestures or non-verbal behavior related to body movements. Thus it is always a mix of verbal or non-verbal communication.

Intercultural communication: the credit of this term is given to **Edward T. Hall**, who used it for the first time in his book **The Silent Language in 1959**. Culture is the characteristics and knowledge of a particular group of people, encompassing language, religion, social habits, music and art. Culture is human creation. **Intercultural communication is the study of communication between people whose cultural perceptions and symbol systems are distinct enough to alter their communication.** Intercultural communication increases our competence.

EXPECTED MCQs

1. Differentiation between acceptance and non-acceptance of certain stimuli in classroom Communication is the basis of:

- (1) Selective expectation of performance
- (2) Selective affiliation to peer groups
- (3) Selective attention
- (4) Selective morality

Answer: (4)

2. Assertion (A): The initial messages to students in the classroom by a teacher need not be critical to establish interactions later.

Reason (R): More control over the communication process means more control over what the students are learning.

Code:

- (1) Both (A) and (R) are true, and (R) is the correct explanation of (A).
- (2) Both (A) and (R) are true, but (R) is not the correct explanation of (A).
- (3) (A) is true, but (R) is false.
- (4) (A) is false, but (R) is true.

Answer: (3)

3. Assertion (A): To communicate well in the classroom is a natural ability.

Reason (R) : Effective teaching in the classroom demands knowledge of the communication process.

Code:

- (1) Both (A) and (R) are true, and (R) is the correct explanation of (A).
- (2) Both (A) and (R) are true, but (R) is not the correct explanation of (A).
- (3) (A) is true, but (R) is false.
- (4) (A) is false, but (R) is true

Answer: (4)

4. Assertion (A): Classroom communication is a transactional process.

Reason (R) : A teacher does not operate under the assumption that students' responses are purposive.

Select the correct code for your answer:

- (1) Both (A) and (R) are true, and (R) is the correct explanation of (A).
- (2) Both (A) and (R) are true, but (R) is not the correct explanation of (A).
- (3) (A) is true, but (R) is false.
- (4) (A) is false, but (R) is true.

Answer: (1)

5. Which of the following set of statements is correct for describing the human communication process?

- (a) Non-verbal communication can stimulate ideas.
- (b) Communication is a learnt ability.
- (c) Communication is not a universal panacea.
- (d) Communication cannot break-down.
- (e) More communication means more effective learning by students.
- (f) Value of what is learnt through classroom communication is not an issue for students.

Code:

- (1) (a), (c), (e) and (f)
- (2) (b), (d), (e) and (f)
- (3) (a), (b), (c) and (d)
- (4) (a), (d), (e) and (f)

Answer: (4)

6. Assertion (A) : Formal communication tends to be fast and flexible.

Reason (R) : Formal communication is a systematic and orderly flow of information.

- (1) Both (A) and (R) are correct and (R) is correct explanation of (A)
- (2) Both (A) and (R) are correct, but (R) is not correct explanation of (A)
- (3) (A) is correct but, (R) is false
- (4) (A) is false but, (R) is correct

Answer: (4)

7. Which of the following are the characteristic features of communication?

- (a) Communication involves exchange of ideas, facts and opinions.
- (b) Communication involves both information and understanding.
- (c) Communication is a continuous process.
- (d) Communication is a circular process.

Select the correct answer from the codes given below:

- (1) (a), (b) and (c)
- (2) (a), (b) and (d)
- (3) (b), (c) and (d)
- (4) (a), (b), (c) and (d)

Answer: (4)

8. Conversing with the spirits and ancestors is termed as

- | | |
|--------------------------------|--------------------------------|
| a. Transpersonal communication | c. Interpersonal communication |
| b. Intrapersonal communication | d. Face to face communication |

Answer: a

Explanation: "trans" means beyond and hence transpersonal communication means beyond persons or human beings. Interpersonal means between two people and intrapersonal means talking to himself or herself.

9. Communication via New media such as computers, teleshopping, the internet and mobile telephony is termed as

- | | |
|------------------------------|------------------------------|
| a. Entertainment | c. Development communication |
| b. Interactive communication | d. Communitarian |

Answer: b

10. Bengal Gazette, the first Newspaper in India was started in 1780 by

- | | |
|---------------------|-------------------------|
| a. Dr. Annie Besant | c. James Augustus Hicky |
| b. Lord Cripson | d. A.O. Hume |

Answer: c

11. Classroom communication of a teacher rest on the principle of

- | | |
|-----------------|------------------|
| a. Infotainment | c. Entertainment |
| b. Edutainment | d. Enlightenment |

Answer: b

12. Telephone is an example of

- | | |
|-------------------------|-----------------------------|
| a. Linear communication | c. non-linear communication |
| b. Circular | d. mechanized |

Answer: a

Explanation: the other examples of linear communication are face-to-face communication, email, charts etc.

13. Means of grapevine communication are

- | | |
|-------------|--------------|
| a. Formal | c. Informal |
| b. Critical | d. Corporate |

Answer: b

Communication in informal groups is basically grapevine communication where hierarchy may not be followed.

14. The communicated knowledge in a classroom is considered as

- | | |
|---------------------------|----------------------|
| a. Non-pervasive treasure | c. Autonomous virtue |
| b. Limited judgment | d. cultural capital |

Answer: d

15. Organizational communication can also be equated with

- | | |
|--------------------------------|------------------------|
| a. Intrapersonal communication | c. group communication |
| b. Interpersonal communication | d. mass communication |

Answer: c

16. The term 'Yellow Journalism' refers to

- Sensational news about terrorism and violence.
- Sensationalism and exaggeration to attract readers/viewers.
- Sensational news about arts and culture.
- Sensational news prints in yellow paper.

Answer: b

17. Effective communication pre-supposes

- | | |
|------------------|------------------|
| a. Non-alignment | c. passivity |
| b. Domination | d. Understanding |

Answer: d

18. When verbal and non-verbal messages are contradictory, it is said that most people believe in

- | | |
|---------------------------|------------------------|
| a. Indeterminate messages | c. non-verbal messages |
| b. Verbal messages | d. aggressive messages |

Answer: c

19. Assertion (A): Empathy is essential for effective communication between the communicator and the communicatee.

Reason (R): Empathy links the teacher and students

- Both A & R are true.
- Both A & R are true but R is not the correct explanation of A
- A is true but R is false
- A is false but R is true

Answer: a

20. The word 'haptics' denotes

- | | |
|--------------------------|----------------------------|
| a. Spatial communication | c. Staggered communication |
| b. Timely communication | d. Tactile communication |

Answer: d

UNIT-5

MATHEMATICAL REASONING & APTITUDE

Reasoning is of two types, namely, verbal and non-verbal. Verbal reasoning is basically about words rather than things. Verbal reasoning tests use words, letters, and numbers and require logical reasoning and a reasonable knowledge of English. It is also necessary to be familiar with simple, basic mathematical operations such as addition, subtraction, division, and multiplication. Non-verbal is basically about figures.

As far as **NTA NET** Exam pattern is concerned, mathematical reasoning is covering mainly verbal and basic mathematical skills such as series completion, coding and decoding, classification (odd man out, and so on), and analogical relationship. Questions on direction sense and seating arrangement also appear regularly in the exam. Some topics such as Direction Sense and Venn Diagrams combine both verbal and non-verbal skills.

Types of Reasoning

1. **Deductive reasoning:** it is also known as analytical reasoning as it deals with objects by looking at its component parts.
2. **Inductive reasoning:** it is also known as synthetically reasoning that deals with a class of objects by looking at the common properties of each object in the class.
3. **Abdicative reasoning:** abdicative reasoning is considered as the third form of reasoning. It is somewhat similar to inductive reasoning. It takes its clues from the term guessing, since conclusions drawn here are based on probabilities.

Series Completion

A series may be a number series or letter series. There are several kinds of series such as finding the missing numbers, replacing the wrong numbers, finding the missing letters, finding the wrong group of numbers or letters, etc.

NUMBER SERIES

Prime Number Series

Example-1

2, 3, 5, 7, 11, 13, ...

a) 18 (b) 19 (c) 15 (d) 17

Solution: This series is a prime number series. So the next number in series is (d) 17.

Example-2

2, 5, 11, 17, 23, 31, 37,

a) 29 (b) 31 (c) 43 (d) 39

Solution: The prime numbers are written alternately. (c) 43

Difference Series

Example-3

2, 5, 8, 11, 14, 17,, 23, 26

a) 19 (b) 21 (c) 20 (d) 18

Solution: The difference between the numbers is (c) 2. ($17+3=20$)

Multiplication Series

Example-4

2, 6, 18, 54,, 486, 1458

a) 152 (b) 182 (c) 162 (d) 108

Solution: The numbers are multiplied by 3 to get the next number. ($54 \times 3 = 162$) (c)

Example-5

3, 12, 48,, 768, 3072

a) 192 (b) 216 (c) 512 (d) 72

Solution: The numbers are multiplied by 4 to get the next number. ($48 \times 4 = 192$) (a)

Division Series

Example-6

32, 48, 72,, 162, 243

a) 84 (b) 96 (c) 108 (d) 132

Solution: Each number is being multiplied by $\frac{3}{2}$ to get the next number. (c)

N2 Series

Example-7

1, 4, 9, 16, 25, 36,, 64

a) 42 (b) 44 (c) 45 (d) 49

Solution: The series is squares of 1, 2, 3, 4, and so on. (d)

Example-8

0, 4, 16, 36, 64,, 144

a) 100 (b) 84 (c) 96 (d) 120

Solution: The series is squares of even number such as 2, 4, 6, 8, 10 and 12. So, the answer is $10^2 = 100$. (a)

N2 – 1 Series

Example-9

0, 3, 8, 15, 24, 35, 48, 63,

a) 80 (b) 82 (c) 83 (d) None of these

Solution: The series is $1^2 - 1$, $2^2 - 1$, $3^2 - 1$, and so on. The next number is $9^2 - 1 = 80$. (a)

Alternative Solution: The differences between the numbers across the series are 3, 5, 7, 9, 11, 13, 15, and 17. The next number is $63 + 17 = 80$.

N2 + 1 Series

Example-10

2, 5, 10, 17, 26, 37,, 65

a) 50 (b) 48 (c) 49 (d) 51

Solution: The series is $12 + 1$, $22 + 1$, $32 + 1$, and so on. The next number is $72 + 1 = 50$. (a)

N2 + N Series and N2 – N Series

Example-11

0, 2, 6, 12, 20, 30,, 56

a) 36 (b) 40 (c) 42 (d) None of these

Solution: The series is 0 (square) $+ 0$, 1 (square) $+ 1$, 2 (square) $+ 2$, 3 (square) $+ 3$ and so on.

The missing number is 6 (square) $+ 6 = 42$. The next number is $62 + 6 = 42$. (c)

First Alternative Solution: The series is 0×1 , 1×2 ,, 1×2 , 2×3 , 3×4 , 4×5 and $5 \times 6 = 30$. The next number is $6 \times 7 = 42$.

Second Alternative Solution: The series is $12 - 1$, $22 - 2$, $32 - 3$, $42 - 4$, $52 - 5$, $62 - 6$, $72 - 7$, $82 - 8$, and so on.

N3 Series

Example-12

1, 8, 27, 64, 125, 216,

a) 256 (b) 343 (c) 365 (d) 400

Solution: The series is 1^3 , 2^3 , 3^3 , etc. The missing number is $7^3 = 343$. (b)

Letter Series Tricks with Questions

A	1	Z	26
B	2	Y	25
C	3	X	24
D	4	W	23
E	5	V	22
F	6	U	21
G	7	T	20
H	8	S	19
I	9	R	18
J	10	Q	17
K	11	P	16
L	12	O	15
M	13	N	14

- ❖ From the above diagram you can easily see the position and opposite word of each alphabet.
- ❖ For Example - Position of D is 4 and opposite letter to D is W and position of W is 23.
- ❖ Position of J is 10 and opposite letter of J is Q and position of Q is 17 and so on.

Find the letter in place of question mark (?) In the series given below:

Q1. B, F,, N, R

- a) G
- b) K
- c) J
- d) L
- e) None of The Above

Solution :- Option C

Trick-



Q2. P,, J, G, D, A

- a) Q
- b) N
- c) K
- d) M
- e) None of The Above

Solution :- Option D

Trick-



Q3., E, G, J, N

- a) A
- b) B
- c) D
- d) Z
- e) None of The Above

Solution :- Option C

Trick-

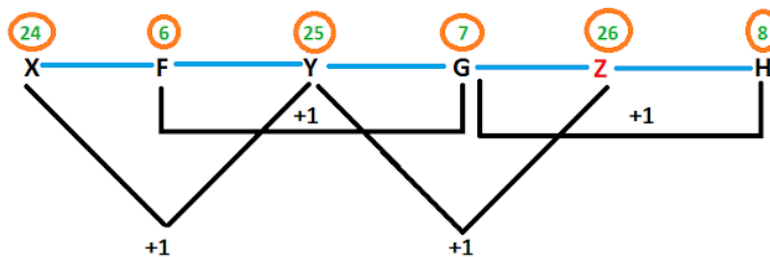


(Numbers in Circles shows the position of alphabets)

Q4. X, F, Y, G,, H

- a) Z
b) A
c) B
d) Y
e) None of The Above

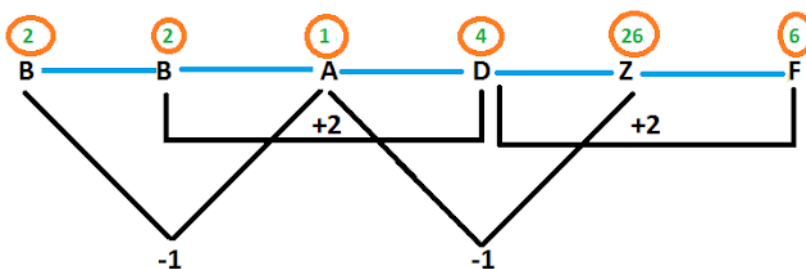
Solution :- Option A



Q5. B, B, A, D,, F

- a) B
b) A
c) Z
d) C
e) None of The Above

Solution :- Option C

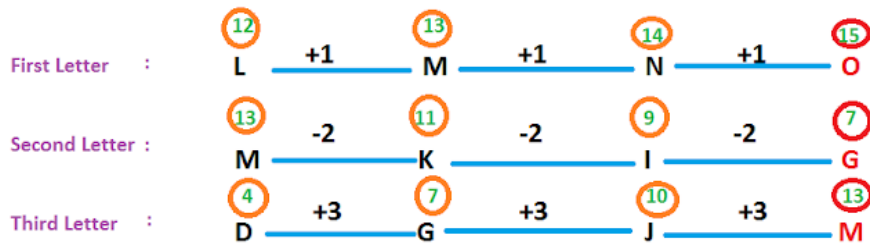


Q6. LMD, MKG, NIJ,

- a) PKM

- b) MGO
c) LGM
d) OGM
e) None of The Above

Solution :- Option D

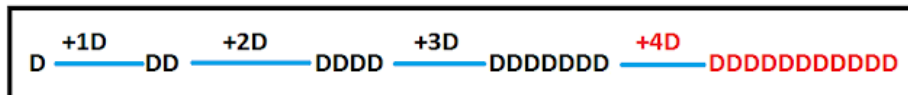


Q7. D, DD, DDDD, DDDDDDD,

- a) DDDDDDDDD
b) DDDDDDDDDDD
c) DDDDDDD
d) DDDDDDDDDDDDD
e) None of The Above

Solution :- Option D

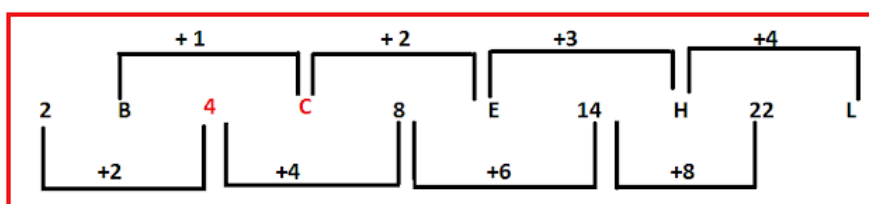
Trick -



Q8. 2B,, 8E, 14H, 22L

- a) 4C
b) 4D
c) 6E
d) 9F
e) None of The Above

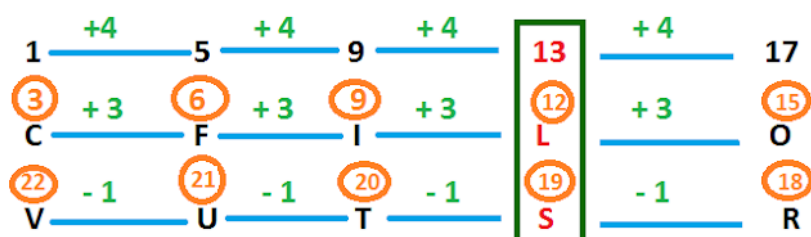
Solution :- Option A



Q9. 1 CV, 5 FU, 9 IT,, 17 OR

- a) 11LS
- b) 14JS
- c) 15JS
- d) 13LS
- e) None of The Above

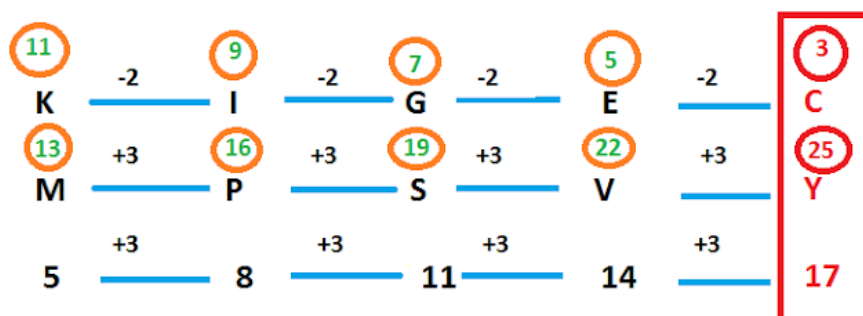
Solution :- Option D



Q10. K M 5, 1 P 8, G S 11, E V 14,

- a) C Y 17
- b) B Y 17
- c) B X 17
- d) C Z 17
- e) None of The Above

Solution :- Option A



CODING

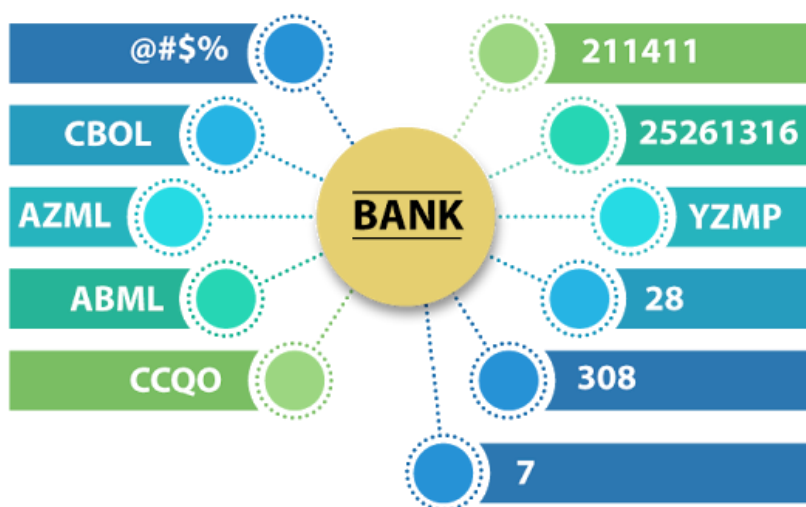
Coding is a process in which a word, a number, or a series of combination of words and numbers is expressed in a particular code or pattern based on various rules. You have to answer the questions based on these set of rules.

Decoding is the process of (interpreting) deciphering the coded pattern and reverting it to its original form from the given codes. Hence, you are required to understand the logic behind the coding pattern and then apply this logic to and answers

Coding and Decoding basically means sending out information in a coded manner to someone so that the people involved in transferring this information are not able to understand it. However, the person to whom the information is transferred is able to decode it using some reasoning tricks. This method of transferring information was extremely popular during both the World Wars and till much later, till technology finally took over use of these reasoning tricks.

There are infinite **reasoning tricks** that are use to write **codes**, which means you can get various kinds of questions based on coding and decoding. We shall discuss some very popular reasoning tricks that will help you decipher codes and solve questions based on it.

The image below shows how different reasoning tricks have been used to write codes for the word – **"BANK"**. Let's now decode these codes and learn some reasoning tricks while doing the same.



Reasoning Tricks 1: Symbol based Coding

When codes are written using symbols, in that case, each symbol represents a letter in the word that has been coded. Like in this case,

BANK = @#\$%

B = @

A = #

N = \$

K = %

So once we find the codes for each of these symbols, we can find the code for any word. As we know in keyboard there are various symbol keys. These symbols are putted on numerical keys on keyboard.

Reasoning Tricks 2: Shifting the Position Forward

In this form of codes, every letter in the word is represented by another letter. From the code below you can observe-

BANK = CBOL

$B = C$

$A = B$

$N = O$

$K = L$

The logic behind this kind of coding is shifting of letters; in this case, letters have been shifted in the forward direction. The letter which comes after 'B' is 'C', the letter which comes after 'A' is 'B' and so on. So each letter has been shifted by +1 in the alphabetical order. In a similar manner, letters can be shifted forward by 2, 3 or even more positions.

Reasoning Tricks 3: Shifting the Position Backward

When codes are written like this, every letter is once again represented by another letter. From this code, we know-

BANK = AZML

$B = A$

$A = Z$

$N = M$

$K = J$

This coded form is very similar to the previous one because once again shift of positions has happened; only this time letters have been shifted backwards. We know as per alphabetical order 'A' comes before 'B', 'Z' comes before 'A' and so on, for the remaining part of the word. As you see, each letter has seen a shift of -1 in its position in the code. Similarly, while using reasoning tricks like this, letters can be shifted backwards any number of positions.

Reasoning Tricks 4: Alternate Shifting Form

Codes are often written in a manner to confuse you and throw you off guard. This coding-decoding example is a clear example of this –

BANK = ABML

$$B = A$$

$$A = B$$

$$N = M$$

$$K = L$$

Once again positions of letters have been changed in codes, but they are a mixture of forward and backward positions. You will notice 'B' is replaced by 'A' and A comes before B. On the other hand, 'A' is replaced by 'B', and B comes after A. So, the first letter has been moved backwards while the second letter has been moved forward. Similarly, for the 3rd and 4th letters, 'N' is replaced by 'M' which is one ahead and 'K' is replaced by 'L' which is one backwards. Therefore positions of letters are shifted alternately in this method of coding and decoding and this shift can be of any number of units.

Reasoning Tricks 5: Position Based Increase

The way to code that we will discuss now may look a little complicated, but once you crack the reasoning tricks behind it, it becomes really simple!



$$BANK = CCQO$$

$$B = C$$

$$A = C$$

$$N = Q$$

$$K = O$$

Now notice carefully, 'B' is moved ahead by +1 since it comes 'C', 'A' is moved ahead by +2 as it becomes 'C', 'N' is moved ahead by +3 and it comes 'Q' and finally 'K' becomes 'O' as it is moved ahead by +4. So if you notice, each alphabet has moved ahead in the code by the number of positions, depending on its position in the word that has been coded. Therefore, the increase with every position can vary in patterns too.

Reasoning Tricks 6: Numeric Position in Alphabetical Order

You don't need to get scared every time you see a word coded in numbers because these reasoning tricks used in coding and decoding is really simple. The number denotes the position of the letter in the alphabetical order.



$$BANK = 211411$$

$$B = 2$$

$$A = 1$$

$$N = 14$$

K = 11

We know 'B' comes 2nd in the series of alphabets, 'A' comes 1st, 'N' comes at the 14th position and 'K' comes at the 11th position. All these numbers are simply written in the same order and this code is achieved. Similarly, any word can be coded by just writing its numeric position in the alphabetical order. To get hold of such reasoning tricks, it is almost mandatory that you learn the numeric positions of alphabets in the alphabetical order.

Reasoning Tricks 7: Numeric Positions in Reverse Alphabetical Order

The logic behind this is really simple! As the name suggests the numbers suggest the position of the letters, but only in the reverse order. So as per this method of coding and decoding, 'Z' becomes 1 and 'A' becomes 26.

BANK = 25261316

B = 25

A = 26

N = 13

K = 16

So if we know the positions of letters in alphabetical order, it becomes easy to find their position in the reverse order. When discussing the topic of 'Ranking', in Reasoning Ability we discussed that when we know the position of one element from one end, we can easily find the position of the element from the other end too by using a simple formula-

Position in Reverse Order = $T - P + 1$

T = Total Number of Elements, P = Position from the given End

This formula can also be used to find the position of the letters in the reverse order. Let's start with the letter 'A' and see how this formula simplifies reasoning tricks for us-A' = Position of A in the reverse order, using the formula we get -A' = $26 - 1 + 1$ A' = 26 Similarly we can try for B', C' and any other alphabet. B' = $26 - 2 + 1 = 25$ C' = $26 - 3 + 1 = 24$

By using this formula for the letters 'N' and 'K', we get the code- 25261316

Reasoning Tricks 8: Reverse Alphabetical Order

The logic for this code is very similar to the previous one. As the name implies, the letters in the code are those letters which are at the same numeric position when the reverse alphabetical order is taken.

BANK = YZMP

$$B = Y$$

$$A = Z$$

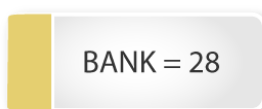
$$N = M$$

$$K = P$$

So as per this method of coding and decoding, 'B' comes at the 25th position and therefore it becomes 'Y', 'A' comes at the 26th position and therefore it becomes 'Z', similarly 'N' becomes 'M' and 'K' becomes 'P'.

Reasoning Tricks 9: Sum of Positions

This kind of coding is very interesting, the 4 letter word is reduced to a 2 digit number. It is actually the sum of positions of the letters in alphabetical order.



$$BANK = 28$$

$$B = 2$$

$$A = 1$$

$$N = 14$$

$$K = 11$$

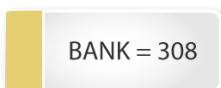
Adding the numeric positions of these alphabets, we get

$$2 + 1 + 14 + 11 = 28$$

Similarly, any word can be coded by summing up the position of the letters in the word.

Reasoning Tricks 10: Product of Positions

This method of coding is not very different from the previous method of coding because this also deals with the positions of letters in the alphabetical order.



$$BANK = 308$$

$$B = 2$$

$$A = 1$$

$$N = 14$$

$$K = 11$$

Multiplying the numbers that denote the positions of the letters, we get –

$$2 \times 1 \times 14 \times 11 = 308$$

In a similar manner, any word can be coded by taking the product of its position.

Reasoning Tricks 11: Average of Positions

This unique method of coding again uses a mathematical operation, and the operation used here is- Average. An average is taken of the positions of the letters in the word.



$$\text{BANK} = 7$$

$$B = 2$$

$$A = 1$$

$$N = 14$$

$$K = 11$$

We know average is equal distribution of elements, so we can calculate the average –

$$(2 + 1 + 14 + 11) / 4 = 28/4 = 7$$

Taking an average of the positions of the letters in the word is another way to code it.

RELATIONSHIP

In blood relation test, questions are asked about the blood relations of a group of persons or a small family or between two to three people. In these type of questions, an examiner normally checks the ability of a candidate to correlate different relationships. These questions are normally very tricky as we have to concentrate on each and every single statement and words in the question. After understanding the question, we have to make a clear picture of the well-defined blood relations in the question by comparing with our self so that we can easily find the answers to the questions.

For the easy understanding of the candidates a table containing few main relations is given below:

- ❖ Grandson's son : Father or uncle
- ❖ Grandson's son : Father or uncle
- ❖ Grandson's only son : Father
- ❖ Grandmother's only son : Father
- ❖ Mother's or Father's mother : Grandmother
- ❖ Mother's or Father's : Grandfather
- ❖ Grandfather's only daughter in law : Mother
- ❖ Grandmother's only daughter-in-law – Mother
- ❖ Mother's or Father's son : Brother
- ❖ Mother's or Father's Daughter : Sister
- ❖ Mother's or Father's brother : Uncle
- ❖ Mother's or Father's Sister : Aunt
- ❖ Husband's or Wife's sister : Sister – in – law
- ❖ Husband's or wife's brother – Brother – in – law
- ❖ Son's wife : Daughter – in – law
- ❖ Daughter's husband : Son – in – law
- ❖ Brother's son : Nephew

- ❖ Brother's daughter : Niece
- ❖ Uncle or Aunt's son or daughter : Cousin
- ❖ Sister's husband : Brother – in – law
- ❖ Brother's wife : Sister – in – law

For more clarification, we are presenting the relation in two different forms:

1. Relations of paternal side:


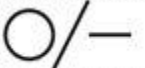
- ❖ Father's Father – Grandfather
- ❖ Father's Mother – Grandmother
- ❖ Father's Brother – Uncle
- ❖ Father's Sister – Aunt
- ❖ Children of Uncle – cousin
- ❖ Wife of Uncle – Aunt
- ❖ Children of Aunt – Cousin
- ❖ Husband of Aunt – Uncle

2. Relations of maternal side:

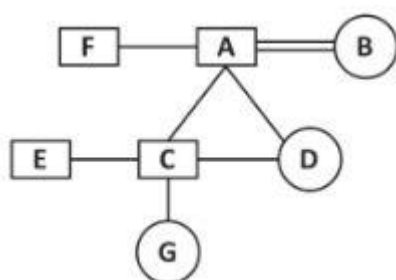
- ❖ Mother's Father – Maternal Grandfather
- ❖ Mother's Mother – Maternal Grandmother
- ❖ Mother's Brother – Maternal Uncle
- ❖ Mother's Sister – Aunt
- ❖ Children of Maternal Uncle – Cousin
- ❖ Wife of Maternal uncle – Maternal Aunt

To solve questions of Blood Relations easily, you can take help of "Generation Tree".

- Different pictorial form which are used to define the relationship among them.

	These two pictorial from are used for males.
	These two pictorial from are used for females

- Representation of different relations



From given generation tree we can deduce some important relationship between family members:

1. A is Father of C, E and D
2. B is Mother of C, E and D
3. F is Brother of A

4. F is Brother in law of B
5. A is Husband of B
6. B is Wife of A
7. F is Uncle of E, C and D
8. C and E are Son of A and
9. D is Daughter of A and B
10. D is Sister of E and C
11. E is Brother of C and D
12. C is Brother of E and D
13. A is Grandfather of G
14. B is Grandmother of G
15. G is Granddaughter of A and B.

• Now we are providing some dialogue or conversation based relations which will make your concept more clear and you will be able to solve dialogue based questions within second.

1. My mother's or father's son is my Brother
2. My mother's or father's daughter is my Sister
3. My Mother's or Father's father is my Grandfather.
4. My Mother's or Father's Sister is my Aunt.
5. My Mother's or Father's Brother is my Uncle.
6. My Son's wife is my daughter-in-law.
7. My daughter's husband is my Son-in-law.
8. My brother's son is my Nephew.
9. My brothers daughter is my Niece.
10. My sister's husband is my brother-in-law.
11. My brother's wife is my sister-in-law.
12. My husband's sister is my sister-in-law.
13. My husband's brother is my brother-in-law.
14. My uncle's or Aunt's son or daughter is my cousin.
15. My wife's mother or husband's mother is my mother-in-law.
16. My father's wife is my mother.

17. My mother's husband is my father.
18. My mother's husband is my father.
19. My son's or daughter's son is my Grandson.
20. My son's or daughter's daughter is my Granddaughter.

• **Types of questions asked from Blood Relations:**

1. Based on Dialogue or Conversation
2. Based on Puzzles
3. Based on symbolically coded

Based on Conversation or Dialogue-

In this type of questions, the one person talking to or doing chit-chat with other person giving information by pointing to some picture or person.

Example: Pointing to a lady on the stage, Monika said, "She is the sister of the son of the wife of my husband." How is the lady related to Monika?

Solution: Find who you can easily relate to and be that person-then go about creating one relation after another.

In this question, be Monika-then start from the end of the sentence.

"My husband" = Monika's husband

'Wife of my husband' = is me = Monika

'Son of the wife of my husband' = My Son

'Sister of the Son of the wife of my Husband' = My Son's Sister = My daughter

'She' is the sister of the son of the wife of my husband' = the lady on the stage = the lady being pointed out = my daughter.

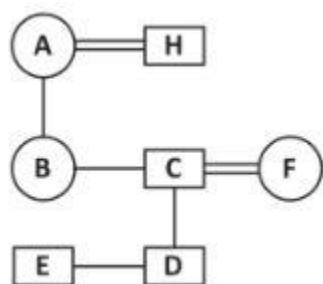
So, lady on the stage is Monika's daughter.

Based on Puzzles:

In this type of question, you have to conclude the relations between two given person based on more than one information given in the question.

Example: A is the mother of B. B is the sister of C. D is the son of C. E is the brother of D. F is the mother of E. H has only two children B and C. How is F related to E?

Solution: In this question, first we will draw the generation's tree:



So, F is mother of E.

Based on Symbols:

In this type of question, information are coded in the form of symbols like \square , #, \$, % etc.

Example:

Direction: Read the following information carefully and then answer the question given below:

(a) $A \square B$ means A is mother of B.

(b) $A \$ B$ means A is sister of B.

(c) $A * B$ means A is father of B.

(d) $A \# B$ means A is brother of B.

Question:- Which of the following means R is uncle of T?

(a) $R * P \# S \square Q \$ T$ (b) $S * P \# R * U \# T$

(c) $P * R \$ Q \$ S * T$ (d) $P * R \$ Q \$ S * T$

(e) None of these

Solution: From option, C, we will get R is uncle of T.

FRACTION

In mathematics, a **fraction** is a number that represents a part of a whole. It consists of a **numerator** and a **denominator**. The numerator represents the number of equal parts of a whole, while the denominator is the total number of parts that make up said whole. **For example**, in the **fraction** $\frac{3}{5}$, the **numerator is 3**, and the **denominator is 5**. A more **illustrative example** could involve a pie with **8 slices**. 1 of those 8 slices would constitute the numerator of a fraction, while the total of 8 slices that comprises the whole pie would be the denominator. If a person were to eat 3 slices, the remaining fraction of the pie would therefore be $\frac{5}{8}$ as shown in the image to the right. **Note** that the **denominator** of a **fraction cannot be 0**, as it would make the fraction undefined.

Fraction = part/whole = numerator / denominator

If there are 5 apples in a carton of 12 apples. Then the fraction of apples for the whole would be represented as $\frac{5}{12}$.

There can be various types of fractions:

1. **Common fraction:** a common fraction is a number written with a numerator and a denominator, in which both are natural numbers. For example, $\frac{5}{12}$, $\frac{17}{12}$ etc.
2. **Proper fraction:** a proper fraction that is less than 1 is known as proper fraction such as $\frac{1}{2}$, $\frac{3}{4}$

3. **Mixed number fraction:** it is basically a whole number plus a proper fraction. For example $2\frac{1}{2} = 2 + \frac{1}{2}$
4. **Improper fraction:** if we divide each whole unit into thirds, and keep counting them then we will come to $\frac{3}{3}$, $\frac{4}{3}$, $\frac{5}{3}$ and so on. That is we will come to fractions that are equal to or greater than 1. We call those improper fractions.

Fractions can undergo many different operations, some of which are mentioned below.



Slice a pizza, and we get fractions:



$\frac{1}{2}$

(One-Half)



$\frac{1}{4}$

(One-Quarter)



$\frac{3}{8}$

(Three-Eighths)

The top number says how many slices we have. The bottom number says how many equal slices the whole pizza was cut into.

Equivalent Fractions

Some fractions may look different, but are really the same, for example:

$\frac{4}{8}$

=

$\frac{2}{4}$

=

$\frac{1}{2}$

(Four-Eighths)

(Two-Quarters)

(One-Half)



=



=



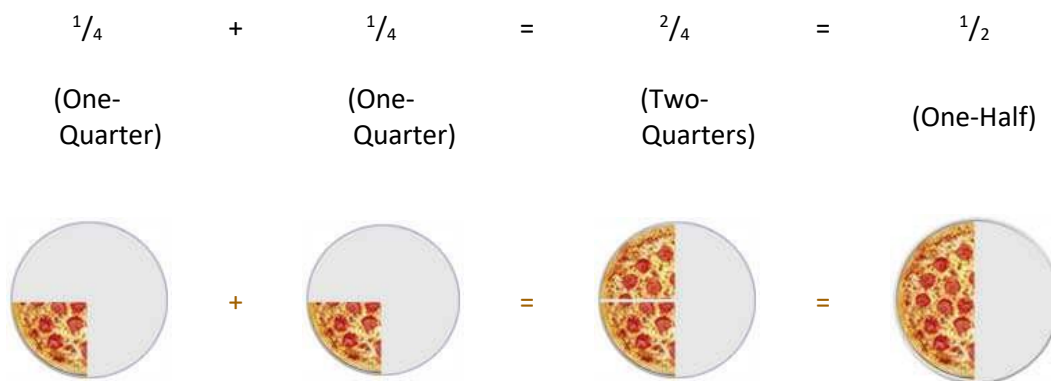
It is usually best to show an answer using the simplest fraction ($\frac{1}{2}$ in this case). That is called **Simplifying**, or **Reducing** the Fraction.

Numerator / Denominator

We call the top number the **Numerator**, it is the number of parts we have. We call the bottom number the **Denominator**, it is the number of parts the whole is **divided into**.

Numerator / Denominator**Adding Fractions**

It is easy to add fractions with the **same denominator** (same bottom number):



One-quarter plus one-quarter equals two-quarters, equals one-half

Q1. In a lass, $\frac{3}{4}$ *th* of the students do not know either English or Hindi. But $\frac{1}{6}$ *th* of the students know English. How many students know both English and Hindi if students who know Hindi are $\frac{1}{8}$ *th* of total students in the class?

- a. $\frac{1}{24}$ b. $\frac{100}{24}$ c. $\frac{10}{12}$ d. $\frac{1}{4}$

Explanation

$\frac{3}{4}$ *th* do not know English or Hindi

So $\frac{1}{4}$ know English or hindi or both

$\frac{1}{6}$ know English and $\frac{1}{8}$ know hindi

Now, $\frac{1}{4} - \frac{1}{6} - \frac{1}{8} = -\frac{1}{24}$

Q2. $\frac{2}{5}$ Of a group of children were girls. If there were 24 girls, then how many children were there in the group?

- a. 32 b. 36 c. 40 d. 42

Solution. 3 units = 24

1 unit = $24 \div 3 = 8$

5 units = $5 \times 8 = 40$

There were 40 children in the group.

Q3. Sham had 120 teddy bears in his retail store. He sold $\frac{2}{3}$ of them at Rupees 12 each. How much did he receive?

- a. 80 b. 85 c. 90 d. 92

Solution.

Step-I: find the number of teddy bears sold.

$$\frac{2}{3} * 120 = 2 * \frac{120}{3} = 80$$

He sold 80 teddy bears.

Step-II: find how much money he received.

$$80 * 12 = 960$$

He received Rupees 960

Q4. A fraction is divided by reciprocal of itself. It is then multiplied by the original fraction. What is the fraction if the answer obtained is $11\frac{25}{64}$

- a. $9/4$ b. $27/8$ c. $9/8$ d. $2/3$

Explanation

Let the fraction be A

As per given condition,

$$\frac{\frac{A}{1}}{A} * A = 11\frac{25}{64}$$

$$A^3 = 729/64$$

$$A = 9/4$$

ANSWER: $9/4$

TIME & DISTANCE

Time is defined as quantity, which governs the order or sequence of an occurrence. In the absence of time, the actual sequence of any occurrence or incident would be lost. If we did not have the concept of time, we would not be able know in what period or in what order something took place.

UNIT OF TIME: hour and second are mostly taken as the unit of time.

TIME = DISTANCE/SPEED

SPEED=DISTANCE/TIME

We can deduce the following from this formula:-

– When time is constant, distance covered is directly proportional to the speed.

– When distance is the same, speed is inversely proportional to time

DISTANCE = SPEED * TIME

Average Speed

Average Speed = Total Distance Traveled / Total Time Taken

- Remember that average speed is NOT the arithmetic mean of the speeds.
- Also, average speed can never be double or more than double of any of the original speeds.

Relative Speed

When two objects with speed S_1 and S_2 respectively and they are traveling in:

- Same direction, the relative speed (S') is the difference of the individual speeds

$$S' = S_1 - S_2$$

- Opposite direction, the relative speed (S') is the sum of the individual speeds

$$S' = S_1 + S_2$$

Trains Crossing

If L_1 and L_2 are the lengths of two trains moving at speeds V_1 and V_2 respectively, then the time taken by them to cross each other given by,

$$\text{Time to Cross} = (L_1 + L_2) / (\text{Relative Speed})$$

Boats & Streams

If a boat traveling at the speed (B) is in a stream, the speed of which is denoted by S and it is traveling:

- Upstream (against the direction in which the stream is flowing)

$$\text{Upstream Speed} = B - S$$

- Downstream (in the same direction as that of the flow of the stream)

$$\text{Downstream Speed} = B + S$$

Circular Motion

- When two runners are on the same circular track, the time taken for them to meet for the first time is given by the following expression:-

$$\text{Length of the track} / \text{Relative speed of the runners}$$

– Number of times two runners meet on the circular track = Number of rounds gained by faster runner over the slower one.

– If ratio of speeds of two runners running in circular track is $x : y$, they will meet at the starting point again in the time given by the following expressions:-

$|x - y|$ time (if running in the same direction)

$(x + y)$ time (if running in the opposite direction)

Questions on Races

Some points to remember while solving questions based on these are as follows:-

– The distance covered by the winner = length of the race

– Loser's distance = winner's distance – (beat distance + start distance)

– Winner's time = loser's time – (beat time + start time)

– If a race ends in a deadlock, i.e. both reach the winning post together then beat time = 0 and beat distance = 0

NOTE: As we know, Speed = Distance/ Time. Now, if in questions Distance is constant then speed will be inversely proportional to time i.e. if speed increases, time taken will decrease and vice versa.

RATE= DISTANCE/TIME

CONVERT FROM kph (kilometer per hour) to mps (meter per second) we use following formula:

$$X \text{ km/hr} = (x \cdot 5/18) \text{ m/sec}$$

Convert from mps (meter per second) to kph (kilometer per hour) we use following formula:

$$X \text{ m/sec} = (x \cdot 18/5) \text{ km/h}$$

If the ratio of the speeds of A & B is $a \times b$, then the ratio of the times taken by them to cover the same distance is $1/a : 1/b$ or $b:a$

Example 1: a man covers 60 km in 4 hours. Find the speed.

Solution

$$\text{Speed} = \text{distance/time} = 60/4 = 15 \text{ kmph}$$

Note: depending upon the answer choices, the kmph can also be converted into m/s by multiplying by $5/18$.

$$\text{Speed (in m/s)} = 15 \cdot 5/18 = 4\frac{3}{18} \text{ m/s}$$

Example 2: a man covers 20 km in $2\frac{1}{2}$ hours. Find the distance covered in 9 hours.

Solution.

$$\text{Speed} = D/T = 20 \text{ Km} / 2\frac{1}{2} \text{ hours} = 8 \text{ kmph}$$

$$\text{Distance covered in 9 hours} = S \times T = 8 \times 9 = 72 \text{ KM}$$

Example 3: a car completes a journey in 4 hours, the first half at a speed of 40 kmph and second at 60 kmph. Find the total distance covered.

Solution.

As the total journey is divided into equal parts, the average speed can be calculated by the formula $2xy/(x+y) = 2 \times 40 \times 60 / (40+60) = 48 \text{ kmph}$.

$$\text{Distance} = S \times T = 48 \times 4 = 192 \text{ km.}$$

Example 4: a student walks from his house at a speed of 3 kmph and reaches the school 10 minutes late. If he walks at a speed of 4 kmph, then he reaches the school 10 minutes earlier. What is the distance between his school and his house?

Solution

Let the distance = x km

Difference between timings of reaching the school at different speed = $10+10=20$ minutes or $20/60$ or $1/3$ hours.

$$\text{Now the difference between timings} = x/3 - x/4 = 1/3$$

$$= 4x - 3x / 12$$

$$X = 4 \text{ km}$$

Example 5: Pankaj starts from his home at a speed of 30 km per hour and reaches his school 20 minutes late. Then the next day he increases his speed by 15 km per hour but still gets late by 8 minutes. How far is his school from his home?

Solution.

Let distance be D

With speed 30 km/hr he is 20 minutes late

With speed 45 km/hr he is 8 minutes late

Therefore difference between two times

$$= 20 - 8 = 12 \text{ min} = 12/60 \text{ hours}$$

$$T = \frac{D}{S}$$

$$\text{Therefore } \frac{D}{30} - \frac{D}{45} = \frac{12}{60}$$

$$D=18 \text{ km}$$

RATIO

Ratio is the relation which one quantity bears to another of the same kind. The ratio of two quantities a and b is the fraction a/b and we write it as a: b.

In the ratio a: b, we call a as the first term or antecedent and b, the second term or consequent.

Note: The multiplication or division of each term of a ratio by the same non- zero number does not affect the ratio.

Compound Ratio: - It is obtained by multiplying together the numerators for new numerator and denominators for new denominator.

Ex: In a class, the ratio of boys and girls is 3:2. If there are total 100 students, then how many boys and girls in the class.

Solution:

Let boys=3x and girls=2x

Now,

$$5x=100$$

$$x=20$$

$$\text{so, boys}=3x=3 \times 20=60 \text{ and girls}=2x=2 \times 20=40$$

Another way:

In 5 (i.e $3+2=5$) students there are 3 boys

so, 1 student, there are $3/5$ boys

$$\therefore \text{In 100 student boys are} = (3/5) \times 100 = 60 \text{ boys}$$

In 5 (i.e $3+2=5$) students there are 2 girls

so, 1 student, there are $2/5$ girls

$$\therefore \text{In 100 student girls are} = (2/5) \times 100 = 40 \text{ girls}$$

OR

Girls = $100 - 60 = 40$ girls

Shortcut:

Boys = $(\frac{3}{5}) \times 100 = 60$ boys

Girls = $(\frac{2}{5}) \times 100 = 40$ girls

Important Point:

⇒ For a ratio, the two quantities must be in the same unit.

Ex: Ratio of Rs 5 to Rs 30 here unit = Rs. In this example both quantities unit are same.

So, Ratio = $5/30 = 1:6$

Ex-2 Ratio of Rs 5 to 30 paise.

Solution: we can't express in the form of a ratio. Because a unit of both quantities is not same. if u want to express in the form of a ratio, first of all, make the unit of both quantities are same ie. Rs 5 to Rs 0.30 or 500 paise to 30 paise.

Rule:

The multiplication or division of each term of a ratio by the same nonzero number does not effect the ratio.

Ex: 4:5

PROPORTION:

If the ratio of the first and second quantities is equal to the ratio of the third and fourth quantities then it is called proportion.

It is represented by → '::'

i.e if $a:b=c:d$, we write $a:b::c:d$ and we say that a, b, c, d are in proportional

Here a and d are called extremes while b and c are called mean terms.

Ex: check 6, 10, 48, 80 are in proportional

Solution: $6/10 = 3/5 = 3:5$

and $48/80 = 3/5 = 3:5$

so, 6, 10, 48, 80 are in proportional.

⇒ Fourth Proportional: If $a:b=c:d$, then d is called the fourth proportional to a, b, c.

⇒ Fourth Proportional (d) = $(b \times c)/a$

⇒ Third Proportional: If $a:b=b:c$, then c is called the third proportional to a and b.

⇒ Third Proportional (c) = b^2/a

⇒ Mean Proportional between a and b = \sqrt{ab} .

⇒ Duplicate ratio of $a:b = a^2:b^2$.

⇒ Sub-duplicate ratio of $a:b = \sqrt{a}:\sqrt{b}$.

⇒ Triplicate ratio of $a:b = a^3:b^3$

PERCENTAGE

Percentage is a very basic and important topic for Quantitative Aptitude as you can solve other topics speedily with its help.

Percentage (%): Percent sign

- ❖ The percent sign is the symbol: %
- ❖ It is written to the right side of the number: 50%

Percentage Definition: The percentage is a value that represents the proportion of one number to another number.

Percentage is per-cent which means parts per hundred (1/100).

If we have to convert percentage into fraction then it is divide by 100.

Example:

If we write **45%** then its equal to **45/100** or in fraction **9/20** or in decimal **0.45**

If we have to convert fraction into percentage we have to multiply it with **100**.

This table will help you solve questions very fast and easily. Try to remember these fractions because it will save a lot of time in your examination.

Percent	Decim al	Fracti on
1%	0.01	1/100
5%	0.05	1/20
10%	0.1	1/10
12 ½%	0.125	1/8
20%	0.2	1/5
25%	0.25	¼
33 ⅓%	0.333	1/3
50%	0.5	½
75%	0.75	¾
80%	0.8	4/5
90%	0.9	9/10
99%	0.99	99/100
100%	1	1
125%	1.25	5/4
150%	1.5	3/2

Types of Formulas and Short Tricks

Type 1:

Percentage Increase/Decrease:

If the price of a commodity increases by R%, then the reduction in consumption so as not to increase the expenditure is:

$$\left[\frac{R}{100+R} \right] \times 100\%$$

If the price of a commodity decreases by R%, then the increase in consumption so as not to decrease the expenditure is:

$$\left[\frac{R}{100-R} \right] \times 100\%$$

If the value of a number is first increased by a% and later decreased by a%. Then the net effect is always decreased which is equal to a% of a and is written is

$$\left(\frac{a^2}{100} \right) \%$$

Type 2:

Results on Population:

Let the population of a town be P now and suppose it increases at the rate of $R\%$ per annum, then:

1. Population after n years = $P[1+R/100]^n$
2. Population n years ago = $P/[1+R/100]^n$
- ❖ If A is $R\%$ more than B , then B is less than A by $\{(R/(100+R)) \times 100\}\%$
- ❖ If A is $R\%$ less than B , then B is more than A by $\{(R/(100-R)) \times 100\}\%$
- ❖ If the price of a commodity increases by $R\%$, then the reduction in consumption so as not to increase the expenditure is: $\{(R/(100+R)) \times 100\}\%$
- ❖ If the price of a commodity decreases by $R\%$, then the increase in consumption so as not to decrease the expenditure is: $\{(R/(100-R)) \times 100\}\%$

Let the population of a town be P now and suppose it increases at the rate of $R\%$ per annum, then

1. Population after n years = $P (1+R/100)^n$
2. Population before n years = $P / (1 + R/100)^n$

Let the present value of a machine be P . Suppose it depreciates at the rate of $R\%$ per annum.

1. Value of the machine after n years = $P(1-R/100)^n$
2. Value of the machine n years ago = $P/(1-R/100)^n$
- ❖ For two successive changes of $x\%$ and $y\%$, net change $\{x + y + xy/100\}\%$

PROFIT & LOSS

IMPORTANT TERMS

Cost Price – The price at which an article is purchased is called the cost price or CP.

Selling Price – The price at which an article is sold is called the selling price or SP.

Marked Price – The price which is written on the article.

Profit / Gain – The difference between SP and C.P if it is positive, that amount is called Profit or Gain. If the selling price of the article is more than its cost price, then the seller makes a profit.

Loss – The difference between CP and SP if it is positive, that amount is called Loss. If the selling price of the article is less than the cost price of the article, then the seller makes suffers a loss on it.

Profit and loss are determined by the value of cost price and selling price. Cost price is the price at which an article is purchased and selling price is the price at which article is sold

- ❖ Profit = selling price - Cost price
- ❖ Loss = Cost price - Selling price

Profit or Loss is always calculated on the **cost price**.

Marked price: This is the price marked as the selling price on an article, also known as the listed price.

Discount or Rebate: This is the reduction in price offered on the marked or listed price.

Below is the list of some basic formulas used in solving questions on profit and loss:

$$\text{Gain \%} = (\text{Gain} / \text{CP}) * 100$$

$$\text{Loss \%} = (\text{Loss} / \text{CP}) * 100$$

$$\text{SP} = [(100 + \text{Gain\%}) / 100] * \text{CP}$$

$$\text{SP} = [(100 - \text{Loss \%}) / 100] * \text{CP}$$

If an article is sold at a gain of 10%, then SP = 110% of CP.

If an article is sold at a loss of 10%, then SP = 90% of CP.

$$\text{CP} = [100 / (100 + \text{Gain\%})] * \text{SP}$$

$$\text{CP} = [100 / (100 - \text{Loss\%})] * \text{SP}$$

IMPORTANT FORMULAE

$$1. \quad \text{Gain} = (\text{S.P.}) - (\text{C.P.})$$

$$2. \quad \text{Loss} = (\text{C.P.}) - (\text{S.P.})$$

3. Loss or gain is always reckoned on C.P.

4. Gain Percentage: (Gain %)

$$\text{Gain \%} = \left(\frac{\text{Gain} \times 100}{\text{C.P.}} \right)$$

5. Loss Percentage: (Loss %)

$$\text{Loss \%} = \left(\frac{\text{Loss} \times 100}{\text{C.P.}} \right)$$

6. Selling Price: (S.P.)

$$\text{SP} = \left[\frac{(100 + \text{Gain \%})}{100} \times \text{C.P.} \right]$$

7. Selling Price: (S.P.)

$$\text{SP} = \left[\frac{(100 - \text{Loss \%})}{100} \times \text{C.P.} \right]$$

8. Cost Price: (C.P.)

$$\text{C.P.} = \left[\frac{100}{(100 + \text{Gain \%})} \times \text{S.P.} \right]$$

9. Cost Price: (C.P.)

$$\text{C.P.} = \left[\frac{100}{(100 - \text{Loss \%})} \times \text{S.P.} \right]$$

10. If an article is sold at a gain of say 35%, then S.P. = 135% of C.P.

11. If an article is sold at a loss of say, 35% then S.P. = 65% of C.P.

12. When a person sells two similar items, one at a gain of say x%, and the other at a loss of x%, then the seller always incurs a loss given by:

$$\text{Loss \%} = \left(\frac{\text{Common Loss and Gain \%}}{10} \right)^2 = \frac{x^2}{100}.$$

If a trader professes to sell his goods at cost price, but uses false weights, then

$$\text{Gain \%} = \left[\frac{\text{Error}}{(\text{True Value}) - (\text{Error})} \times 100 \right] \%$$

Profit percentage = profit \times 100/CP

Example 1: An umbrella was sold at a profit of 20%. What is the selling price of the umbrella if the shopkeeper procured it at a cost of Rupees 180?

Solution

Substituting values in the formula above, we get:

$$\text{Selling price} = [(100+20)/100] \times 180$$

$$\text{Selling price} = 12 \times 18$$

$$\text{Selling price} = 216$$

Therefore, selling price of this umbrella is Rupees 216

Example 2: An article is sold for Rupees 2400 at a profit of 25%. What would have been the actual profit or loss if it had been sold at Rupees 1800?

Solution

$$\text{Initially, let us find the cost price of the same. C.P} = 2400 \times 100/125 = 1920$$

$$\text{Now selling price} = 1800 \Rightarrow \text{loss} = 1920 - 1800 = 120$$

$$\text{Therefore loss percentage} = 100 \times 120/1920 = 6.25\%$$

Example 3: Romit sold his old TV and earned a profit of 10%. If he could have managed to sell it for Rupees 8100 more, then his profit would have been 37%. Find the price at which he bought the TV?

Solution

$$1^{\text{st}} \text{ profit} = 10\%$$

If Romit sells TV for Rupees 8100 more, then profit = 37%

$$\text{S.P} = (100 + \text{Profit \%}) \% \text{ of C.P}$$

$$\text{Therefore SP1} + 8100 = \text{SP2}$$

$$\text{Therefore } (110) \% \text{ C.P} + 8100 = (137) \% \text{ C.P}$$

$$\text{Therefore } 27\% \text{ of C.P} = 8100$$

$$\text{Therefore C.P} = \frac{8100 \times 100}{27} = 30000$$

Example 4: A man bought a horse for a certain sum and sold it, at a loss of 8% on his outlay. If he had received Rupees 1800 more, then he would have gained 14 1/2 % on his outlay. What did the horse cost?

Solution

$C.P = (\text{Difference in S.P}) + (\% \text{ Difference in profit})$

$C.P \text{ of the horse} = 1800 \times 100/14.5 - (-8) = 1800 \times 100/22.5$

$C.P = 8000.$

Example 5: A man purchases two pens for Rupees 740. He sells one at 12% profit and the other at an 8% loss. Then he neither gains nor loses. Find the cost price of each pen.

Solution

$C.P \text{ of 2 pens} = 740.$ Let $C.P \text{ of } 1^{st} \text{ pen be } x \text{ and } C.P \text{ of } 2^{nd} \text{ pen be } y.$

Since there is no profit and loss in the whole transaction, so 12% of $x = 8\%$ of y

$$\Rightarrow x:y=2:3$$

Hence the cost of first pen $= (2/3) \times 740 = 296$ and that of the 2^{nd} pen $= (3/5) \times 740 = 444$

INTEREST

Interest: It is money paid by the borrower for using the lender's money for a specified period of time. Denoted by I .

Principal: The original sum borrowed. Denoted by P .

Time: Time is a period for which the money is borrowed. Denoted by n

Rate of Interest: The rate at which interest is calculated on the original sum. Denoted by r .

Amount: Sum of Principal and Interest and is denoted by A .

(i) Simple interest: When interest is calculated on the original principal for any length of time, it is called simple interest.

- **Simple interest** $= (\text{Principal} \times \text{Time} \times \text{Rate})/100$

$$\text{i.e. S.I.} = (P \times R \times T)/100$$

- **Amount** $= \text{Principal} + \text{Interest}$

$$\text{i.e. } A = P + I = P + PRT/100 = P[1 + RT/100]$$

- **Principal (P)** $= (100 \times \text{S.I.})/(R \times T)$

- **Rate(R)** $= (100 \times \text{S.I.})/(T \times P)$

- **Time (T)** $= (100 \times \text{S.I.})/(P \times R)$

If rate of simple interest differs from year to year, then $\text{S.I.} = P \times ((R_1 + R_2 + R_3 + \dots))/100$

Example: Find the amount to be paid back on a loan of Find the amount to be paid back on a loan of ₹18,000 at 5.5% per annum for 3 years

Solution: $P = \text{`18000}$, $R = 5.5\%$, $T = 3$ years

$$\text{S.I.} = (P \times R \times T) / 100 = (18000 \times 5.5 \times 3) / 100 = \text{Rs.} 2970$$

$$\text{Amount} = P + I = 18000 + 2970 = \text{Rs.} 20970$$

(ii) Compound interest: Money is said to be lent at compound interest when at the end of a year or other fixed period, the interest that has become due is not paid to the lender, but is added to the sum lent, and the amount thus obtained becomes the principal in the next year or period. The process is repeated until the amount for the last period has been found. Hence, when the interest charged after a certain specified time period is added to form new principal for the next time period, the interest is said to be compounded and the total interest accrued is compounded and the total interest accrued is compound interest.

- $\text{C.I.} = p[(1+r/100)^n - 1]$;
- **Amount** $(A) = P(1+r/100)^n$, Where n is number of time period.
- If rate of compound interest differs from year to year, then

$$\text{Amount} = P(1+r_1/100)(1+r_2/100)(1+r_3/100) \dots$$

Example:

If `60000 amounts to `68694 in 2 years then find the rate of interest.

Solution:

$$\text{Given: } A = \text{`68694}$$

$$P = \text{`60000}$$

$$n = 2 \text{ years}$$

$$r = ?$$

$$A = P(1+r/100)^n$$

$$68694 = 60000(1+r/100)^2$$

$$68694/60000 = (1+r/100)^2$$

$$11449/10000 = (1+r/100)^2$$

$$1+r/100 = \sqrt{(11449/10000)} = \sqrt{1.1449}$$

$$1+r/100 = 1.07$$

$$r/100 = 1.07 - 1 = 0.07$$

$$r = 0.07 \times 100 = 7\%$$

Compound Interest-when interest is calculated quarterly

Since 1 year has 4 quarters, therefore rate of interest will become the of the rate of interest per annum, and the time period will be 4 times the time given in years. Hence, for quarterly interest,

$$A = P \left(1 + \frac{r}{4}\right)^{4n} = P(1 + r/400)^{4n}$$

Example: Find the compound interest on ₹25625 for 12 months at 16% per annum, compound quarterly.

Solution: Principal (P) = ₹25625

Rate (r) = 16% = 16/4% = 4%

Time = 12 months = 4 quarters

$$A = 25625 \left(1 + \frac{4}{100}\right)^4 = 25625 \left(\frac{26}{25}\right)^4 = 25625 \times \frac{26}{25} \times \frac{26}{25} \times \frac{26}{25} \times \frac{26}{25} = 29977.62$$

$$\text{C.I.} = A - P = 29977.62 - 25625 = \mathbf{4352.62}$$

EFFECTIVE RATE: If ₹1 is deposited at 4% compounded quarterly, a calculator can be used to find that at the end of one year, the compound amount is ₹1.0406, an increase of 4.06% over the original ₹1. The actual in the money is somewhat higher than the stated increase of 4%. To differentiate between these two numbers, 4% is called the nominal or stated rate of interest, while 4.06% is called the effective rate. To avoid confusion between stated rates and effective rates, we shall continue to use r for the stated rate and we will use r_e for the effective rate.

Example: Find the effective rate corresponding to a stated rate of 6% compound semiannually.

Solution

A calculator shows that ₹100 at 6% compounded semiannually will grow to

$$A = 100 \left(1 + \frac{.06}{2}\right)^2 = 100(1.03)^2 = ₹106.09$$

Thus, the actual amount of compound interest is

$$₹106.09 - ₹100 = ₹6.09. \text{ Now if you earn ₹6.09 interest on}$$

$$₹100 \text{ in 1 year with annual compounding, your rate is } 6.09/100 = .0609 = 6.09\%$$

Thus, the effective rate is $r_e = 6.09\%$

Example: find S.I on Rupees 6250 at 14% per annum for 146 days.

Solution. P = Rupees 6250, R = 14% & T = (146/365) years = 2/5 years

$$\text{S.I} = \frac{6250 \times 14 \times \frac{2}{5}}{100} = 350$$

Example: A certain sum of money amounts to Rupees 1008 in 2 years and to Rupees 1164 in $3\frac{1}{2}$ years. Find the sum and the rate of interest.

Solution.

$$\text{S.I for } 1\frac{1}{2} \text{ years} = \text{Rupees } (1164 - 1008) = 156$$

$$\text{S.I for 2 years} = \text{Rupees } 156 \times \frac{2}{3} \times 2 = 208$$

$$\text{Therefore, principal} = (1008 - 208) = 800$$

$$\text{Now, } p = 800, T = 2 \text{ and } S.I = 208$$

$$\text{Therefore, rate} = (100 \times S.I) / (P \times T) = [(100 \times 208) / (800 \times 2)]\% = 13\%$$

Example: the compound interest on Rupees 30,000 at 7% per annum is Rupees 4347. The period is

Solution.

$$\text{Amount} = (30000 + 4347) = 34347$$

Let the time be n years.

$$\text{Then, } 30000 \left(1 + \frac{7}{100}\right)^n = 34347$$

$$(107/100)^n = 34347/30000 = 11449/10000 = (107/100)^2$$

Therefore $n = 2$ years.

AVERAGE

Average is a tool which is extensively used in data analysis. It is a relative value which lies near the original values. But when it is discussed with respect to consecutive observations it turn into their mean value or mid-value.

What is Average?

A calculated "central" value of a set of numbers.

To calculate: add up all the numbers, then divide by how many numbers there are.

Example: What is the average of 2, 7 and 9?

$$\text{Add the numbers: } 2 + 7 + 9 = 18$$

$$\text{Divide by how many numbers (i.e. we added 3 numbers): } 18 \div 3 = 6$$

So the average is 6

CATEGORISATION OF AVERAGE

AVERAGE FOR CONSECUTIVE TERMS	AVERAGE FOR NON CONSECUTIVE TERMS
When the number of observations is Even. The average can be determined by adding the first and the last term and dividing the sum by 2. When the number of observations is Odd. The average can be determined by adding the first and the	$\text{Average} = \frac{\text{Sum of observation}}{\text{Number of observation}}$ $\text{Sum of Obs.} = \text{Avg.} \times \text{numbers of obs.}$ $\text{No of obs.} = \frac{\text{Sum of observation}}{\text{Average}}$

What is the first thing that comes in your mind after hearing average?

In simple words we can say that average is that common value which may be assigned to all and after doing this end result will be same.

The average of the number of quantities of observations of the same kind is their sum divided by their number.

The average is also called average value or mean value or arithmetic mean.

Average = Sum of terms / Number of terms

- ❖ The result obtained by adding several quantities together and then dividing this total by the number of quantities is called Average.
- ❖ The main term of average is equal distribution of a things. We obtain the average of a number using formulae that is sum of observations divided by Number of observations

Important Formulae Related to Average of numbers

1. Average of first n natural numbers = $(n + 1)/2$
2. Average of first n even numbers = $(n + 1)$
3. Average of first n odd numbers = n
4. Average of consecutive numbers = $(\text{First number} + \text{Last number})/2$
5. Average of 1 to n odd numbers = $(\text{Last odd number} + 1)/2$
6. Average of 1 to n even numbers = $(\text{Last even number} + 2)/2$
7. Average of squares of first n natural numbers = $[(n + 1)(2n + 1)]/6$
8. Average of the cubes of first n natural number = $[n(n + 1)^2]/4$
9. Average of n multiples of any number = $[\text{Number} \times (n + 1)]/2$

Concept 1

If the average of n_1 observations is a_1
; the average of n_2 observations is a_2 and so on, then
Average of all the observations
= $(n_1 \times a_1 + n_2 \times a_2 + \dots) / (n_1 + n_2 + \dots)$

Concept 2

If the average of m observations is 'a' and the average of n observations taken out of is 'b', then
 Average of rest of the observations = $(ma - nb) / (m - n)$

Example:

A man bought 20 cows in Rs.200000. If the average cost of 12 cows is Rs.12500, then what will be the average cost of remaining cows?

Here $m = 20$, $n = 12$, $a = 10000$, $b = 12500$

Average cost of remaining cows $(20 - 12)$ cows
 $= (20 \times 10000 - 12 \times 12500) / (20 - 12) = \text{Rs.}6250$

Concept 3

If the average of n students in a class is a , where average of passed students is x and average of failed students is y , then

Number of students passed = $[\text{Total Students} (\text{Total average} - \text{Average of failed students})] / (\text{Average of passed students} - \text{Average of failed students}) = [n(a - y)] / (x - y)$

Example:

In a class, there are 75 students and their average marks in the annual examination is 35. If the average marks of passed students is 55 and average marks of failed students is 30, then find out the number of students who failed.

Here, $n = 75$, $a = 35$, $x = 55$, $y = 30$

Number of students who passed
 $= 75(35 - 30) / (55 - 30) = 15$

Number of students who failed = $75 - 15 = 60$

Concept 4

If the average of total components in a group is a , where average of n components (1st part) is b and average of remaining components (2nd part) is c , then Number of remaining components (2nd part) = $[n(a - b)] / (c - a)$

Example:

The average salary of the entire staff in an office is Rs.200 per day. The average salary of officers is Rs.550 and that of non-officers is Rs.120. If the number of officers is 16, then find the numbers of non-officers in the office.

Here $n = 16$, $a = 200$, $b = 550$, $c = 120$

Number of non-officer = $16(200 - 550) / (120 - 200) = 70$

Average Speed: Average speed is defined as total distance travelled divided by total time taken.

Average speed = $\text{Total distance travelled} / \text{Total time taken}$

UNIT-6

LOGICAL REASONING

Reasoning is an important section in aptitude tests and the one the student needs to master necessarily. To seek accurate explanation, we have to apply logic. Logic is applying principles of reasoning to obtain valid inferences. Logical reasoning is largely about adopting complete rational approach to solve a problem, with no chance for ambiguity.

Deductive reasoning

Premise: all dogs have long ears.

Premise: hound is a dog.

Conclusion: therefore, hound has long ears.

In **deductive reasoning**, conclusion is guaranteed to be true if the premises are true. Therefore, in the deductive inference, the conclusion cannot be more general than premises. Given the premises that all dogs have long ears and hound is a dog, it is logical to assume that hound has long ears. After all, in this example, having long ears are an inherent quality of dogs. This argument is valid.

The conclusions are based on the premises and one of the premises is not true, it follows that the conclusion is not true, then the conclusion is also not true.

Deductive inference is further categorized into immediate (where conclusion is drawn from a single statement) and mediate (where conclusion is drawn from two statements, called syllogism).

Inductive reasoning

Inductive reasoning is the process of making generalized decisions after observing or witnessing, repeated specific examples of something. Inductive reasoning, while not 100% accurate 100% of the time, is still a relatively quick way to make decisions. Sometimes, saving time is as important as being accurate.

Over the course of our lifetime, we have witnessed hundreds of instances when animals eat, whether it is a cow, an elephant, or a horse. Inductive reasoning tells us that all animals must eat to survive. Have we ever witnessed every animal on earth eat? Of course, the answer is no.

However, by basic biology and common experience, we know that all animals must eat to survive. That is called inductive reasoning.

Deductive Inference

Statement I: All vegetables contain vitamins.

Statement II: Carrot is a vegetable.

Conclusion: So carrot contains vitamins.

Inductive Inference

Statement I: Most vegetables contain vitamins.

Statement II: Carrot is a vegetable

Conclusion: So carrot contains vitamins.

Deductive inferences are further categorized into (i) immediate- where conclusion is drawn from a single statement and (ii) mediate (where conclusion is drawn from two statements, called syllogism).

Structure of Arguments.

An argument, in general is a form of communication that tries to persuade its audience to adopt a particular position about a topic. Arguments have three main parts, such as a claim that states the

position to be argued; reasons that logically explain why the claim should be accepted and evidence that supports the reasons with facts, anecdotes, statistics, expert testimony and examples.

Validity of Arguments

Deductive arguments may be either valid or invalid. If an argument is valid, it is a valid deduction and if its premises are true, the conclusion must be true. A valid argument cannot have true premises and a false conclusion. The validity of an argument depends, however, not on an actual truth or falsity of its premises and conclusion, but solely on whether the argument has a valid logical form or not. The validity of an argument is not a guarantee of the truth of its conclusion. Under a given interpretation, a valid argument may have false premises that render it inconclusive. The conclusion of a valid argument with one or more false premises may be either true or false.

Logic seeks to discover the valid forms, the forms that make arguments valid. A form of argument is valid if and only if the conclusion is true under all interpretations of that argument in which the premises are true. Since the validity of an argument depends solely on its form, an argument can be shown to be invalid by showing that its form is invalid. This can be effected by giving a counterexample of the same form of argument with the given premises that are true under a given interpretation, but a conclusion is false under that interpretation. In informal logic, this is called a counterargument.

Example:

1. **Some Indians are logicians and therefore, some logicians are Indians.**

Valid argument: it would be self-contradictory to admit that some Indians are logical but deny that some logicians are Indians.

2. **All Indians are human and all humans are mortal and therefore, all Indians are mortal.**

Valid argument: if the premises are true, the conclusion must be true.

3. **Some Indians are logicians and some logicians are tiresome and therefore some Indians are tiresome.**

Invalid argument: for example, the tiresome logicians might all be Chinese.

4. **Either we are all doomed or we are all saved; we are not all saved and therefore, we are all doomed.**

Valid argument: the premises entail the conclusion.

Remember that this does not mean the conclusion has to be true; it is only true if the premises are true, which they may not be.

Premises

I: some men are lawyers.

II: some lawyers are rich.

Conclusion: some men are rich.

This argument is invalid. There is a way where you can determine whether an argument is valid and give a counterexample with the same argument form.

Note: logical strength and soundness are properties of argument. Truth or false is a property of statements or premises or conclusion. Never say that argument is false or that premise is logically strong.

Counterexample:

In logic, a counterexample is an exception to a proposed general rule. For example, all students are lazy, makes the claim that a certain property holds for all students, even a single example of a diligent student will prove it false. Thus, any hardworking student is a counterexample to 'all students are lazy'. More precisely, a counterexample is a specific instance of the falsity of a universal quantification.

Structure of logical argument is based on

- a. Formal validity.
- b. Material truth.
- c. Linguistic expression.
- d. Aptness of examples.

Answer (A); as discussed, an argument is valid if and only if truth of its premises entails the truth of its conclusion, and each step, sub-argument or logical operation in the argument is valid.

Analogous argument:

These are basically inductive reasoning. The analogies are not the arguments. However, analogies are mostly used in those arguments. To argue by analogy is to argue that because two things are similar – what is true of one is also true of the other also. Such argument are called analogical arguments. For example, like the earth, Europa has an atmosphere containing oxygen; it means that there might be life on Europa because it has an atmosphere that contains oxygen just like the earth.

Proposition

A **proposition** is a sentence that makes a statement and gives a relation between two or more terms. In logical reasoning, any statement is termed as a proposition.

A proportion is assumed to be true and from which a conclusion can be drawn. The statement, all cats are lemons' is assumed to be true as a proportion, but actually we all know that cats and lemons are entirely different entities.

A **premise** is a statement or proposition that is assumed to be true and from which a conclusion can be drawn.

Quantifier + Subject + Copula + Predicate

Thus, the proposition consists of four parts:

1. Quantifier: All, no, and some. They specify a quantity. 'All' and 'no, are universal quantifier and 'some' is a particular quantifier.
2. Subject (S): About which something is being said.
3. Predicate (P): Something that affirms or denies about the subject.
4. Copula: Relation between subject and predicate.

Examples:

All bats are boys

some players are doctors.

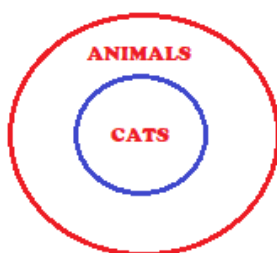
Classification of Propositions

Propositions are basically of two types, namely, universal and particular. Universal proposition is further divided into two parts:

1. Universal Positive or affirmative (A); It denotes inclusion.
Form: All S is P where S is the subject and P is the predicate. Example: 'All cats are animals'. It is basically about inclusion.

Distribution: It distributes the subject only. In the above statement, cats are distributed in animals.

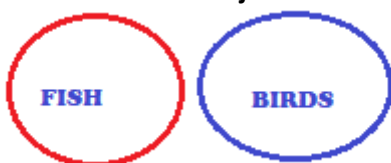
Predicate is not interchangeable with the subject while maintaining the validity of a proposition. We cannot say that all animals are cats.



2. Universal Negative (E): It denotes exclusion.

Form: No S is P. Example: 'No fish are birds' would be a universal negative.

Distribution: Both subject and predicate. Here, an entire class of predicate term is denied to the entire class of the subject term.

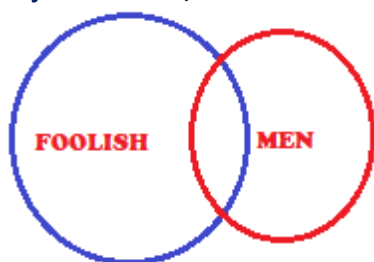


Particular Propositions: A particular proposition can also be divided into two parts.

1. Particular Positive (I): It denotes 'partial inclusion'.

Form: Some S is P. Example: Some men are foolish.

Distribution: Neither the subject nor the predicate. In the example, subject term, men is used not for all but only for some men and similarly the predicate term, foolish is affirmed for a part of subject class. So, both are undistributed.



2. Particular Negative (O): It denotes 'partial exclusion'.

Form: Some S is not P or Not every S is P.

Example: Some bird are not carnivores'.

Distribution: Only of predicate.

Validity of Arguments

Deductive arguments may be either valid or invalid. If an argument is valid, it is a valid deduction,

and if its premises are true, the conclusion must be true. A valid argument cannot have true premises and a false conclusion.

Types and Main characteristics of Propositions:

Sign	Statement form	Examples	Quantity	Quality	Distributed
A	All S are P	All politicians are liars	Universal	Positive	Only subject
E	No S are P	No politicians are liars	Universal	Negative	Both subject and predicate
I	Some S are P	Some politicians are liars	Particular	Positive	Neither subject nor predicate
O	Some S are not P	Some politicians are not liars	Particular	Negative	Only predicate

Parts of Categorical Propositions

There are three parts of statements in categorical syllogism-major premise, minor premise, and conclusion, Each of the premise has one term in common with the conclusion.

Parts	Example
Major premise	All humans are mortal
Minor premise	All Greeks are humans
Conclusion	All Greeks are mortal

- 1. Major premise:** Predicate of the conclusion is called as the major term. The premise containing major term is called major premise. In the example, mortal is the major term.
- 2. Minor premise:** Subject of the conclusion is called minor term. The premise containing minor term is called minor premise. In the example, Greeks is the minor term.
- 3. Middle Term:** One term common in both the premises is called middle term. It is not a part of conclusion. In the example, humans is the middle term.
- 4. Conclusion:** In conclusion statement, first term or (subject) is the subject of the first proposition and second term (or predicate) is the predicate of the second proposition.

Converting Common Language Statements into their Logical Forms

In logical reasoning or syllogism problems, the common language sentences may have to be converted into their logical form before we apply logic rules on them to draw a conclusion. The rules of reduction can help in solving these types of questions.

- 1. A-type propositions:** Statements starting with words 'each', 'every', 'any' etc. are to be treated as A-type propositions (starting with all)

Original sentence	Logical form
Every man is liable to commit error	All men are persons who are liable to commit mistakes
Each student participated in the event	All students are persons who participated in the event
Any one of the Indians is laborious	All Indians are laborious
Only Indians are students of this college	All students of this college are Indians
The honest alone are successful	All successful persons are honest.

2. E-type propositions: Sentences with singular term or definite singular term with the sign of negation are to be treated as E-type propositions. Sentences beginning with the words like 'no', 'never', and 'none' are to be treated as E-type propositions. 'Never men are perfect' it 'No men are perfect' in its logical form.

3. I-type propositions: Affirmative sentences with words like 'a few', 'certain', 'most', and 'many' are to be treated as I-type propositions.

Sentence	Logical form
A few men are present	Some men are present
Most of the students are laborious	Some students are laborious
Few men are not selfish	Some men are selfish
Certain books are good	Some books are good
Man Indians are religious	Some Indians are religious
All students of my class, except a few, are well prepared	Some students of my class are well prepared
The poor may be happy	Some poor people are happy

4. O- type propositions: A negative can sentence that begins with a word like 'every', 'any', 'each', or 'all' is to be treated as an O-type proposition.

Sentence	Logical form
Every man is not rich	Some men are not rich
Certain books are not readable	Some books are not readable
Most of the students are not rich	Some students are not rich
Some men are not above temptation	Few men are above temptation

5. Exclusive proposition

(a) In exclusive propositions, the subject is qualified with words like 'only', 'along', 'none but', or 'not one else but'.

(b) Here, the quantity is not explicitly stated.

(c) They can be reduced to A , E or-types by first interchanging the subject and worlds like 'only' or 'alone' with 'all'

1. Exercise:

Statements

1. Intelligent alone are laborious.

2. Most of the girls are intelligent.

These statements should first be converted into logical forms according to the rules for logical form.

1. All intelligent are laborious. This is in the form B to C.

2. Some girls are intelligent. This is in the form A to B.

Just by changing their order, we can align tm. After alignment is done, we move to Step it.

2. Exercise:

Statements

1. Some pens are books.

2. Some stationary are books

As books is the common term, they are in the form A to B and C to B. The first statement does not require any change. As the second statement is in Particular positive, this can be changed to I-type only according to conversion table given earlier. The second statement will

become, 'Some books are stationary'. Now propositions are properly aligned that is, 'Some pens are books' and 'Some books are stationary'. We now move to Step II.

Rule of Syllogism

Proposition I(A to B)	Proposition II(B to C)	Conclusion	Summarized form
Universal Positive(A)	Universal Positive(A)	Universal Positive (A)	A+A=A
Universal Negative(E)	Universal Negative(E)	A+E=E	
Universal Negative(E)	Universal Positive(A)	Particular negative(O)	E+A=O*
Particular Positive(I)	Particular Negative(O)	E+I=O*	
Particular Positive(I)	Universal Positive(A)	Particular Positive(I)	I+A=I
Universal Negative(E)	Particular Negative(O)	I+E=O	

MCQs

1. Tanya is older than Eric.
Cliff is older than Tanya.
Eric is older than Cliff.
If the first two statements are true, the third statement is

- A. true B. false C. uncertain

Answer: Option B

Explanation:

Because the first two statements are true, Eric is the youngest of the three, so the third statement must be false.

2. Blueberries cost more than strawberries.
Blueberries cost less than raspberries.
Raspberries cost more than strawberries and blueberries.
If the first two statements are true, the third statement is

- A. true B. false C. uncertain

Answer: Option A

Explanation:

Because the first two statements are true, raspberries are the most expensive of the three.

View Answer Discuss in Forum Workspace Report

3. All the trees in the park are flowering trees.
Some of the trees in the park are dogwoods.
All dogwoods in the park are flowering trees.
If the first two statements are true, the third statement is

- A. true B. false C. uncertain

Answer: Option A

Explanation:

All of the trees in the park are flowering trees, So all dogwoods in the park are flowering trees.

4. Mara runs faster than Gail.
Lily runs faster than Mara.
Gail runs faster than Lily.
If the first two statements are true, the third statement is

- A. true B. false C. uncertain

Answer: Option B

Explanation:

We know from the first two statements that Lily runs fastest. Therefore, the third statement must be false.

5. Apartments in the Riverdale Manor cost less than apartments in The Gaslight Commons.
Apartments in the Livingston Gate cost more than apartments in the The Gaslight Commons.
Of the three apartment buildings, the Livingston Gate costs the most.
If the first two statements are true, the third statement is

- A. true B. false C. uncertain

Answer: Option A

Explanation:

Since the Gaslight Commons costs more than the Riverdale Manor and the Livingston Gate costs more than the Gaslight Commons, it is true that the Livingston Gate costs the most.

6. The Kingston Mall has more stores than the Galleria.
The Four Corners Mall has fewer stores than the Galleria.
The Kingston Mall has more stores than the Four Corners Mall.
If the first two statements are true, the third statement is

- A. true B. false C. uncertain

Answer: Option A

Explanation:

From the first two statements, you know that the Kingston Mall has the most stores, so the Kingston Mall would have more stores than the Four Corners Mall.

7. All the tulips in Zoe's garden are white.
All the pansies in Zoe's garden are yellow.
All the flowers in Zoe's garden are either white or yellow
If the first two statements are true, the third statement is

- A. true B. false C. uncertain

Answer: Option C

Explanation:

The first two statements give information about Zoe's tulips and pansies. Information about any other kinds of flowers cannot be determined.

8. During the past year, Josh saw more movies than Stephen.
Stephen saw fewer movies than Darren.
Darren saw more movies than Josh.
If the first two statements are true, the third statement is

- A. true B. false C. uncertain

Answer: Option C

Explanation:

Because the first two sentences are true, both Josh and Darren saw more movies than Stephen. However, it is uncertain as to whether Darren saw more movies than Josh.

9. Rover weighs less than Fido.
 Rover weighs more than Boomer.
 Of the three dogs, Boomer weighs the least.
 If the first two statements are true, the third statement is

- A. true B. false C. uncertain

Answer: Option A

Explanation:

According to the first two statements, Fido weighs the most and Boomer weighs the least.

10. All the offices on the 9th floor have wall-to-wall carpeting.
 No wall-to-wall carpeting is pink.
 None of the offices on the 9th floor has pink wall-to-wall carpeting.
 If the first two statements are true, the third statement is

- A. true B. false C. uncertain

Answer: Option A

Explanation:

If no wall-to-wall carpeting is pink and all the offices have wall-to-wall carpeting, none of the offices has pink wall-to-wall carpeting.

MOODS & FIGURES

Argument: An argument is a set of statement one of which (the conclusion) is taken by the remaining statement (the premise).

An argument contains both premises and conclusion.

A categorical syllogism meets the following strict qualifications to be in a standard form.

1. It is an argument with two premises and one conclusion.
2. All three statements are categorical propositions.
3. It contains exactly three different terms,
4. Each term is used exactly twice.

The following standards can apply form categorical syllogisms.

Minor term (P): Predicate of conclusion.

Minor term (S): subject of conclusion.

Middle term (M): term that occurs in both premises.

S & P stand for minor term and major term and also stood for subject term and predicate term.

Major premise: premise containing major term.

Minor premise: premise containing minor term.

Mood depends upon the type of propositions (**A, E, I or O**). It is a list of the types beginning the major premise and ending with the conclusion. The mood of a syllogism is determined by the quantity and quality of the three propositions.

The figure of a categorical syllogism is determined by middle term.

A detailed analysis of syllogism reveals the hidden complexities of the same. Such a study consists in the discussion of the structure of syllogism which leads to figures and moods. It is not possible to

fully appreciate the role played by moods in the study of syllogism without prior discussion of what is known as figure. Figure & mood together determines the structure of syllogism. In deductive inference, it is a prerequisite to the classification of arguments into valid and invalid.

The following example illustrates what standard form means.

All humans are mortal

Jatin is a human.

Therefore Jatin is mortal.

Suppose that only O proposition comprises of an argument, then the mood of the argument is said to be OOO. Similarly a syllogistic argument with a mood of OAO has an O proposition as its major premise, an A proposition as its minor premise, and another O proposition as its conclusion and EIO has an E as its major premise and an I as the minor premise, and an O as the conclusion.

1. Major premise: All H are M. HAM
Minor premise: J is H JAH
Conclusion: therefore J is M JAM
2. Major premise: All R are H. RAH
Minor premise: No R are L REL
Conclusion therefore some L are not H LOH

- **P1: All birds are animals.** Major premise
- **P2: turkey vultures are bird.** Minor premise
- **Conclusion: turkey vultures are animals**
- **Here, birds is the middle term**

- **P1: All Christians believe Jesus is the son of God** Major premise
- **P2: Bill is a Christian** Minor premise
- **Conclusion: Bill believes Jesus is the son of God**
- **Here, bill is the middle term**

There are mainly four steps:

- ❖ Make argument in a **standard form**.
- ❖ Determine the mood of argument.
- ❖ Determine the figure of the argument.
- ❖ Check the validity (is it conditionally valid or unconditionally valid)

POINTS TO REMEMBER:

Major term: it is the predicate of the conclusion and is found in the major premise. It is usually designated by "P" which means the predicate of the conclusion.

Minor term: it is the subject of the conclusion and is found in the minor premise. It is usually designated by "S" which the subject if the conclusion.

Middle term: Occurs in the each of the premise but not in the conclusion.

First step: Make the argument in a standard form

- **In a standard form the predicate of the conclusion must come from major premise and the subject of the conclusion must come from minor term.**

- **P 1: All men are animals.**
- **P2: All animals are mortal.**
- **Conclusion: All men are mortal.**

The above argument is not in the standard form, so we have to make it in standard form by interchanging the premises.

P 1: All animals are mortal.

P2: All men are animals.

Conclusion: All men are mortal.

Here mortal is the major term, men is the minor term and animals is the middle term.

Second step: Determine the Mood

P 1: All animals are mortal.

P2: All men are animals.

Conclusion: All men are mortal.

The mood of the above argument is AAA

Third step is to find out the figure

- The figure will come out from the middle terms of the premise, there are four possible figures that can come out from the premises. The possible figures are shown below:

FIGURE-1	FIGURE-2	FIGURE-3	FIGURE-4

EXAMPLE:

- **P1: No lion can be found in India.**
- **P2: All carnivorous animals are Lion.**
- **Conclusion:** No Carnivorous animals can be found in India.
- Mood and figure: **EAE 1**

Now check is it valid or invalid

- There are 256 possible outcome from categorical syllogisms using the A, E, I, O statement forms in the square of opposition.
- Only 24 are valid form out of 256 and further 15 are unconditionally valid and 9 are conditionally valid.

GIVEN BY: BOOLEN

UNCONDITIONALLY VALID FORMS

Figure 1	Figure 2	Figure 3	Figure 4
AAA	EAE	IAI	AEE
EAE	AEE	AII	IAI
AII	EIO	OAO	EIO
EIO	AOO	EIO	

GIVEN BY: ARISTOTILE

CONDITIONALLY VALID FORMS

Figure 1	Figure 2	Figure 3	Figure 4	Required condition
AAI EAO	AEO EAO		AEO	S exists
		AAI EAO	EAO	M exists
			AAI	P exists

EXAPMLE:

- **P1: All tools are table**
- **P2: All tables are chair.**
- **Conclusion: All tools are chair**
- **Mood and Figure: AAA 4**

In this case argument is unconditionally and conditionally invalid.

FORMAL & INFORMAL FALLACIES

Fallacies are errors but can be tricks of reasoning. Fallacy is an error of reasoning if it occurs accidentally; it is a trick of reasoning if a speaker or writer uses it in order to deceive or manipulate his audience. A fallacy is an argument or an apparent argument, which professes to be decisive of the matter at the issue, while in reality it is not. Fallacies weaken arguments and in doing so, weaken the overall strength of our assignment.

Usually there are five common categories of fallacies and they are listed below:

1. Using feelings
2. Distracting from the argument
3. Misinformation
4. Generalisations
5. Irrelevant connections

There are basically two types of fallacy

1. **Formal Fallacy-** a formal fallacy occur when there is a mistake in the formation of argument. Most formal fallacies are errors of logic, where the conclusion is not supported by the premises, so it does not really follow the word from. Either the premises are untrue or the argument is invalid. Given below is an example of an invalid deductive argument.

Premise: all black bugs are carnivores.

Premise: all rats are carnivores.

Conclusion: all rats are black bugs.

Bugs are a subset of carnivores. Rats also are a subset of carnivores. But these two subsets do not overlap, and that fact makes the conclusion illogical. The argument is invalid that is the relationship between the premises doesn't support the conclusion.

How to recognize the formal fallacies?

'Rats are black bugs' is instantaneously recognizable as fallacious, it sounds illogical also. However, that and other forms of poor logic play out on a daily basis and they have real world consequences. For example.

Premise: all Europeans are Christians

Premise: all Russians are Christians

Conclusion: all Russians are Europeans

This argument fails on two levels.

1. The premises are untrue because although many Europeans and Russians are Christians, not all are.
2. The two ethnic groups are set that do not overlap but the two groups are confused because they largely share one common quality.

2. Informal Fallacy- an informal fallacy occur when there is mistake in the interpretation of argument or we can say there is a mistake in the content of the argument.

Informal fallacies take many forms. They are wide spread in our routine lives. Informal fallacies develop when the relationship between premises and conclusion does not hold up, when premises are unsound. Informal fallacies are more dependent on misuse of language and of evidence.

Frequently, they may bring irrelevant information into an argument or they are based on assumptions that, when examined, prove to be incorrect, but it may not always be easy to spot them. Some moves are always fallacious and other may be allowable on the basis of content.

To test an argument for fallacies is to focus on the concept of ethos, logos and pathos.

Ethos: for ethics, authority and credibility.

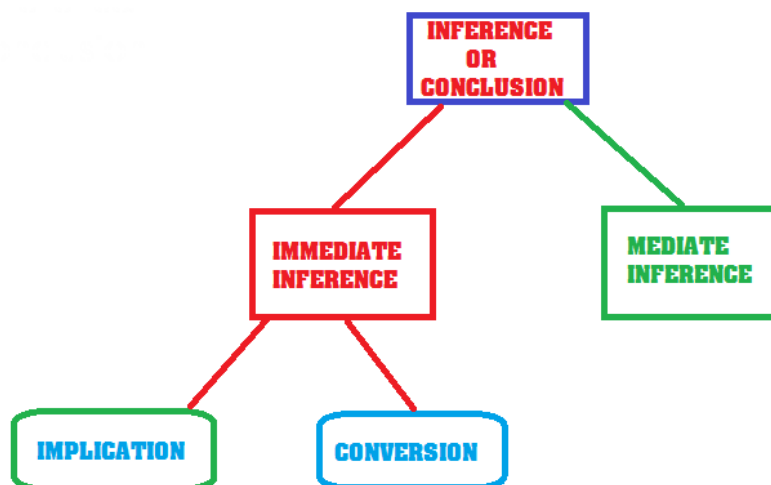
Logos: an appeal to logic.

Pathos: an appeal to emotion.

Ethos, logos and pathos can be used to strengthen our argument or inappropriately to manipulate an audience through the use of fallacies. Some fallacies may fit into multiple categories. Thus we can see that both formal and informal fallacies are errors of reasoning, and if speaker or writer relies on such fallacies, even unintentionally, he or she undercuts their argument.

To recognise different kinds of formal fallacy you must know, AEIO method of syllogism.

Given by Aristotle:



Immediate inference: when inference come out from only one premise.

Implication: when subject and object remain same that is called implication.

A-----I

E.g. All men are mortal

Some men are mortal

E-----O

E.g. No birds are mammal

Some birds are not mammal

I and O cannot be implicate

A	I
E	O
I	can't be implicated
O	can't be implicated

Conversion: when subject is converted into predicate and predicate is converted in to subject.

A ----- I

e.g. All cats are Dog ----- Some dogs are cat

E ----- E

e.g. No dancer is player ----- No player is dancer

I ----- I

e.g. Some dancers are players ----- Some players are dancers.

O cannot be converted

Mediate inferences: when conclusion is drawn from two premise.

1. If Two universal positive premise will give universal positive conclusion.

A+A=A

e.g. P1: All dogs are cats

P2: All cats are rats.

C: All dogs are rats

2. If one universal positive premise with universal negative Premise conclusion will give universal negative conclusion.

A+E=E

3. If one universal negative premise with one universal positive premise, the conclusion will be particular negative (REVERSE)

E+A= O (Reverse)

e.g. P1: No singer is dancer.

P2: All dancers are actor.

C: Some actors are not singers.

4. If one universal negative premise with particular positive premise, the conclusion will be particular negative.

E+I= O (Reverse)

e.g. P1: No singer is dancer.

P2: some dancers are actor.

C: Some actors are not singer.

5. If particular positive premise with universal positive premise, then conclusion will be particular positive.

I+A=I

E.g. p1: Some dancers are singers.

P2: All singers are actor

C: Some dancers are actor.

6. if particular positive premise with universal negative premise, then Conclusion will be particular negative.

I+E=O

E.g. P1: Some singers are dancers

P2: No dancers are actor

C: Some singers are not actor

Premise	Premise	Conclusion
A	A	A
A	E	E
E	A	O (REVERSE)

E	I	O(REVERSE)
I	A	I
I	E	O

PONITS TO REMEMBER:

- ❖ There should be one premise affirmative.
- ❖ If there is both premise positive then conclusion can't be positive.
- ❖ If there is one premise negative then conclusion must be negative.

FORMAL FALLACIES

Which involves on error in the form, arrangement or technical structure of an arguments. The question in view is not whether a conclusion is true or false, but whether the form of the argument is correct or incorrect, valid or invalid..

E.g. P1: All Arabs are Muslims

P2: All Iranians are Muslims

C: All Iranians are Arabs.

Types of Formal Fallacy

- ❖ *Illicit Conversion*
- ❖ *Illicit Contraposition*
- ❖ *Invalid immediate inferences*
- ❖ *Illicit contrary*
- ❖ *Illicit sub contrary*
- ❖ *Illicit sub alternation*
- ❖ *The fallacy of undistributed middle*
- ❖ *Illicit major and minor*
- ❖ *Exclusive premise*
- ❖ *Affirmative from negative*
- ❖ *Existential fallacy*

1. Illicit conversion

The formal fallacy where the subject and the predicate terms of the proposition are switched (*conversion*) in the conclusion, in a proposition that uses "all" in its premise (type "A" forms), or "some/not" (type "O" forms).

Logical Form:

All P are Q.

Therefore, all Q are P.

Some P are not Q.

Therefore, some Q are not P.

I and E can be converted into same form

2. Illicit contraposition

A **formal fallacy** where switching the subject and predicate terms of a categorical proposition, then negating each, results in an invalid argument form. The **examples** below make this more clear. This is a fallacy only for type "E" and type "I" forms, or forms using the words "no" and "some", respectively.

Logical Forms:

No S are P.

Therefore, no non-P are non-S.

Some S are P.

Therefore, some non-P are non-S.

3. Invalid immediate inferences

An immediate inference is an inference which can be made from only one statement or proposition..

E.g. P: "All toads are green."

C: "No toads are not green."

There are three types of invalid immediate inferences:

Illicit contrary

Illicit sub contrary

Illicit sub-alternation

Note: the incorrect application of the contradictory relations are so infrequent that fallacy usually not recognised.

It is false that all P are S, therefore no P are S is true.

Illicit Sub contrary

Some P are S is true, therefore some P are not S is false.

Illicit sub alternation

Some P are not S is true, therefore No P are S is also true.

The fallacy of undistributed middle, minor and major

Name	Form	Quantity	Quality	Distribution SUBJECT	Distributed predicate
A	All A are B	Universal	Affirmative	Distributed	undistributed
E	No A are B	Universal	Negative	Distributed	Distributed

I	Some A are B	Particular	Affirmative	Undistributed	Undistributed
O	Some A are not B	Particular	Negative	Undistributed	Distributed

UNDISTRIBUTED MIDDLE

Fallacy of the **undistributed middle**. The fallacy of the undistributed middle is a formal fallacy that is committed when the middle term in a categorical syllogism is not distributed in either the minor premise or the major premise. It is thus a syllogistic fallacy.

E.g. P1: All singers are dancers

P2: Some dancers are not actor

C: Some actors are not singers.

4. Illicit Fallacy of undistributed major

Illicit major is a formal fallacy committed in a categorical syllogism that is invalid because its major term is undistributed in the major premise but distributed in the conclusion.

This fallacy has the following argument form:

Example:

All dogs are mammals

No cats are dogs

Therefore, no cats are mammals

5. Illicit Fallacy of undistributed minor term

Illicit minor is a formal fallacy committed in a categorical syllogism that is invalid because its minor term is undistributed in the minor premise but distributed in the conclusion.

This fallacy has the following argument form:

Example:

Pie is good.

Pie is unhealthy.

Thus, all good things are unhealthy.

6. Exclusive premise Fallacy

In an argument at least one premise must affirmative if it is not happen then its called exclusive premise Fallacy

P1: No dogs are cats

P2: some cats are not mammals.

C: No dogs are mammals

7. Affirmative From Negative

If there is one premise negative in the argument then conclusion drawn from it must be negative, means can't be affirmative

Example:

P1: No Lions are Tigers

P2: Some Tigers are Leopard

C: Some Lions are leopard

8. Existential Fallacy

A formal logical fallacy, which is committed when a categorical syllogism employs two universal premises ("all") to arrive at a particular ("some") conclusion.

In a valid categorical syllogism, if the two premises are universal, then the conclusion *must* be universal, as well.

Example:

All babysitters have pimples.

All babysitter club members are babysitters.

Therefore, some babysitter club members have pimples.

9. FALLACY OF AFFIRMING THE CONSEQUENT

An error in formal logic where if the consequent is said to be true, the antecedent is said to be true, as a result.

Modus Ponens

If p then q.

p.

Therefore, q.

Modus Tollens

If p then q.

q.

Therefore, p

Consequent: the propositional component of a conditional proposition whose truth is conditional; or simply put, what comes after the "then" in an "if/then" statement?

Antecedent: the propositional component of a conditional proposition whose truth is the condition for the truth of the consequent; or simply put, what comes after the "if" in an "if/then" statement.

E.g.

If taxes are lowered, I will have more money to spend.

I have more money to spend.

Therefore, taxes must have been lowered.

If Mukesh ambani owns Ford knox, then Mukesh ambani is rich

If Mukesh ambani is rich, then he will own Ford knox

FALLACY OF SUFFICIENCY**Hasty generalization**

- *also known as: **argument from small numbers**, statistics of small numbers, insufficient statistics, argument by generalization, faulty generalization, hasty induction, inductive generalization, insufficient sample, lonely fact fallacy, over generality, overgeneralization, unrepresentative sample*
- **Meaning:**
- A faulty generalization is a conclusion about all or many instances of a phenomenon that has been reached on the basis of just one or just a few instances of that phenomenon. It is an example of [jumping to conclusions](#). we may generalize about all people, or all members of a group, based on what we know about just one or just a few people. If we meet an angry person from a given country X, we may suspect that most people in country X are often angry. If we see only white swans, we may suspect that all swans are white.
- E.g. My father smoked four packs of cigarettes a day since age fourteen and lived until age sixty-nine. Therefore, smoking really can't be that bad for you.

Slippery slope

- *also known as **absurd extrapolation**, thin edge of the wedge, camel's nose, domino fallacy*
- **Meaning:** It is an argument that suggests taking a minor action will lead to major and sometimes ludicrous consequences means predicting negative consequences with insufficient evidence.

Example: Colin Closet asserts that if we allow same-sex couples to marry, then the next thing we know we'll be allowing people to marry their parents, their cars and even monkeys.

Weak analogy

- *also known as: **bad analogy, false analogy, faulty analogy, questionable analogy, argument from spurious similarity, false metaphor***
- **Meaning:** A weak analogy occurs when a person draws a comparison between two concepts, situations, or things to link them together in an argument, even though the connection between the two is not strong enough to make the case. It's a type of fallacy or flaw that can damage an argument.
- E.g. That group of teenagers is up to no good - they are out after dark, and they are wearing dark clothes and baggy pants. (Reality: This is a stereotype - the group of teenagers could be a sports team or church group.)

Post Hoc Ergo Propter Hoc

- Also known as **false cause**
- **Meaning:** ("after this, therefore because of this") is a [logical fallacy](#) that states "Since event Y *followed* event X, event Y must have been *caused* by event X." It is often shortened simply to *post hoc fallacy*.

- E.g. A tenant moves into an apartment and the building's furnace goes faulty. The manager blames the tenant's arrival for the malfunction. One event merely followed the other, in the absence of causality.

Argumentum ad verecundiam

- *also known as: argument from authority, ipse dixit*
- **Meaning:** Insisting that a claim is true simply because a valid authority or expert on the issue said it was true, without any other supporting evidence offered. Also see the [appeal to false authority](#).
- E.g.
- Movie should be hit because, Salman khan is working on it.

Argumentum ad ignorantiam

- *also known as: appeal to ignorance*
- **Meaning:** The assumption of a conclusion or fact based primarily on lack of evidence to the contrary. Usually best described by, "absence of evidence is not evidence of absence."
- E.g. No one can actually prove that God exists; therefore God does not exist.

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Petito principia

- *also known as: assuming the initial point, assuming the answer, chicken and the egg argument, circulus in probando, circular reasoning [form of], vicious circle.*
- **Meaning:** Petitio Principii (begging the question) is the fallacy of assuming in a premise a statement which is taken to have the same meaning as the conclusion of the argument. Thus, what is to be proved has already been assumed in the premises. In other words, you assume without proof the stand/position, or a significant part of the stand, that is in question. Begging the question is also called arguing in a circle.

E.g.

- Happiness is the highest good for a human being, since all other values are inferior to it.

Complex Question

- *also known as: many questions fallacy, fallacy of presupposition, loaded question, trick question, false question*
- **Meaning:** A question that has a presupposition built in, which implies something but protects the one asking the question from accusations of false claims. It is a form of misleading discourse, and it is a fallacy when the audience does not detect the assumed information implicit in the question and accepts it as a fact.
- E.g. Is your stupidity inborn?
- Have you stopped beating your wife?

False dichotomy

- *also known as: all-or-nothing fallacy, false dichotomy, the either-or fallacy, either-or reasoning, fallacy of false choice, fallacy of false alternatives, black-and-white thinking, the fallacy of exhaustive hypotheses, bifurcation, excluded middle, no middle ground, polarization*
- **Meaning:** A false dilemma is a type of informal fallacy in which something is falsely claimed to be an "either/or" situation, when in fact there is at least one additional option.

A false dilemma can arise intentionally, when a fallacy is used in an attempt to force a choice or outcome.

- Present the false assumption that you have only two possibility.
- E.g. Child to parent: Either you buy me this new book, or you decide that reading is not important at all.

Suppressed evidence

- Also known as cherry picking, fallacy of incomplete evidence, argument by selective observation, argument by half-truth, card stacking, fallacy of exclusion, ignoring the counter evidence, one-sided assessment, slanting, one-sidedness
- **Meaning:** When only select evidence is presented in order to persuade the audience to accept a position, and evidence that would go against the position is withheld. The stronger the withheld evidence, the more fallacious the argument. This fallacy committed when relevant evidence is purposely omitted in the argument but it is contrary to what the author is trying to prove
- E.g. That type of car is poorly made; a friend of mine has one, and it continually gives him trouble.

FALLACY OF CLARITY

Equivocation

- also known as: doublespeak
- **Meaning:** In logic, equivocation ('calling two different things by the same name') is an informal fallacy resulting from the use of a particular word/expression in multiple senses throughout an argument leading to a false conclusion.
- E.g. Since only man [human] is rational, and no woman is a man [male], Therefore, no woman is rational. A feather is light [not heavy]. What is light [bright] cannot be dark. Therefore, a feather cannot be dark

Amphiboly

- **Meaning:** Instead of using the same word with multiple meanings, as with the Fallacy of Equivocation, the Fallacy of Amphiboly involves the use of sentences which can be interpreted in multiple ways with equal justification due to some defect in the grammar, sentence structure, and punctuation or both.

e.g. The anthropologists went to a remote area and took photographs of some native women, but they weren't developed

Composition

- also known as: **composition fallacy, exception fallacy, faulty induction**
- **Meaning:** Inferring that something is true of the whole from the fact that it is true of some part of the whole. This is the opposite of the fallacy of division.
- E.g. Each brick in that building weighs less than a pound. Therefore, the building weighs less than a pound.

- Hydrogen is not wet. Oxygen is not wet. Therefore, water (H₂O) is not wet.

Division

- also known as: false division, faulty deduction, division fallacy
- Meaning: Inferring that something is true of one or more of the parts from the fact that it is true of the whole. This is the opposite of the fallacy of composition.
- E.g. His house is about half the size of most houses in the neighborhood. Therefore, his doors must all be about 1/2 feet high.
- Mobile is expensive and worthy, its every spare part is expensive and worthy

USES OF LANGUAGE

- ❖ Informative
- ❖ Expressive
- ❖ Directive

Different uses of language

Philosophical Investigations book by the philosopher **Ludwig Wittgenstein**, first published, posthumously, in **1953**, in which **Wittgenstein** discusses numerous problems and puzzles in the fields of semantics, logic, philosophy of mathematics, philosophy of psychology, philosophy of action, and philosophy of mind.

The Functions of Language (i.e., its purpose; what it does; its uses)

1. Informative language function: essentially, the communication of information.

- a. The informative function affirms or denies propositions, as in science or the statement of a fact..
- b. This function is used to describe the world or reason about it (e.g., whether a state of affairs has occurred or not or what might have led to it).
- c. These sentences have a truth value; that is, the sentences are either true or false (recognizing, of course, that we might not know what that truth value is). Hence, they are important for logic.

2. Expressive language function: reports feelings or attitudes of the writer (or speaker), or of the subject, or evokes feelings in the reader (or listener).

- a. Poetry and literature are among the best examples, but much of, perhaps most of, ordinary language discourse is the expression of emotions, feelings or attitudes.
- b. Two main aspects of this function are generally noted: (1) evoking certain feelings and (2) expressing feelings.
- c. Expressive discourse, qua expressive discourse, is best regarded as neither true or false. E.g., Shakespeare's King Lear's lament, "Ripeness is all!" or Dickens' "It was the best of times, it was the worst of times; it was the age of wisdom; it was the age of foolishness..." Even so, the "logic" of "fictional statements" is an interesting area of inquiry.

3. Directive language function: language used for the purpose of causing (or preventing) overt action.

- a. The directive function is most commonly found in commands and requests.
- b. Directive language is not normally considered true or false (although various logics of commands have been developed).
- c. Example of this function: "Close the windows." The sentence "You're smoking in a nonsmoking area," although declarative, can be used to mean "Do not smoke in this area."

Several other uses of language deserve mention.

1. The ceremonial--(also ritual language use) probably something quite different from simply mixing the expressive and directive language functions because performative aspects are included as well. Example: "Dearly beloved, we are gathered here together to witness the holy matrimony of"

2. Performative utterances: language which performs the action it reports. For example, "I do" in the marriage ceremony and the use of performative verbs such as "accept," "apologize," "congratulate," and "promise." These words denote an action which is performed by using the verb in the first person—nothing more need be done to accomplish the action.

3. Phatic language: "Elevator talk" and street-corner conversations accomplishing a social task. Note the subtle transition from vocal behavior to body language from saying for example, "Hi" or "How are you?" to a nod or a wave of the hand.

4. Most of the examples we have been talking about are not merely of academic interest, even though we cannot take time out to trace the far reaching consequences. (E.g., in law, when a speaker is charged "with inciting to riot," the prosecution must maintain he was using the directive language function, while the defense will probably argue that the speaker was only expressing his feelings. Also, performative utterances are not normally subject to hearsay rules since they imply an action taken.)

The Forms of Language (types of sentences) and the dangers of identifying form with function in the use of language.

A. Much discourse serves all three functions--one cannot always identify the form with the function. Consider this chart for the following possibilities. But note that context often determines the purpose of an utterance. "The room is cool" might be used in different contexts as informative (an observation), expressive (how one feels at the moment), or directive (to turn on the heat).

Informative language use:

Essentially, the communication of information

1. The informative function affirms or denies propositions, as in science or the statement of a fact.
2. These sentences have a truth value; that is, the sentences are either true or false
3. Hence, they are important for logic.

Expressive language use: reports feelings or attitudes of the writer (or speaker), or of the subject, or evokes feelings in the reader (or listener).

1. Poetry and literature are among the best examples, expression of emotions, feelings or attitudes.

2. Two main aspects of this function are generally noted: (1) evoking certain feelings and (2) expressing feelings.

Directive language use: language used for the purpose of causing (or preventing) overt action.

1. Commands and requests.

2. Directive language is not normally considered true or false

3. Eg: "Close the door." "You're smoking in a nonsmoking area," can be used to mean "Do not smoke in this area."

Analysis of complicated facts

Stability of thoughts: If you think something but not able to express then there is no stability of the thoughts but if we can express then there is stability of thoughts with use of language we can stable thoughts.

Kinds of Agreement and Disagreement

1. Agreement in belief and agreement in attitude: There aren't any problems in this instance, since both parties hold the same positions and have the same feelings about them.

2. Agreement in belief but disagreement in attitude: This case, if unnoticed, may become the cause of endless (but pointless) shouting between people whose feelings differ sharply about some fact upon which they are in total agreement.

3. Disagreement in belief but agreement in attitude: In this situation, parties may never recognize, much less resolve, their fundamental difference of opinion, since they are lulled by their shared feelings into supposing themselves allied.

4. Disagreement in belief and disagreement in attitude: Here the parties have so little in common that communication between them often breaks down entirely.

Connotation & Denotation

Words are not limited to one single meaning. Most of the words do have multiple meanings, which are either categorized as denotative or connotative. The denotation of a word is its explicit definition as limited in a dictionary. Let us consider the word home as an example. The denotative or literal meaning of home is a place where one lives; a residence. The expressiveness of a language, however comes from the other type of word meaning, such as connotation or the association or set of associations that a word usually brings to mind. The connotative meaning of home is a place of security, comfort and family. The quote 'east or west, home is the best' does not refer to denotative meaning of home, but the emotions the word home evokes in most of us. By definition, synonyms have the same denotation or literal meaning, but almost always have different connotations.

Fact, Opinion, Belief and Prejudice

In these types of questions, a statement is given, where the candidate has to answer whether the statement is a fact, a prejudice, a belief or just an opinion.

Statement

English is an invaluable asset in international communication.

Mark

- a. If the statement is a fact
- b. If the statement is an advice.
- c. If the statement is an opinion.
- d. If the statement is a prejudice.

Similarly, there were statements.

1. Decline of the British Empire should have resulted in the decline of English,
2. Persons educated through a foreign language are sure to be unpatriotic.

Facts

A fact is verifiable. We can determine whether it is true by researching the evidence. The facts are as follows.

1. Things known for certain to have happened.
2. Things known for certain to be true.
3. Things known for certain to exist.

This may involve numbers, dates, testimony and so on. For example, India got independent on 15 August 1947. Facts provide crucial support for the assertion of an argument.

Opinion

An opinion is a judgement based on facts, an honest attempt to draw a reasonable conclusion from factual evidence. Opinions are as follows.

1. Things believed to have happened.
2. Things believed to be true.
3. Things believed to exist.

For example, we know that lakhs of people go without proper medical care in India, and so someone forms the opinion that the country should institute national health insurance even though it would cost few thousand millions of rupees. An opinion is potentially changeable, depending on how the evidence is interpreted. Opinions are debatable, but facts usually are not.

Prejudice

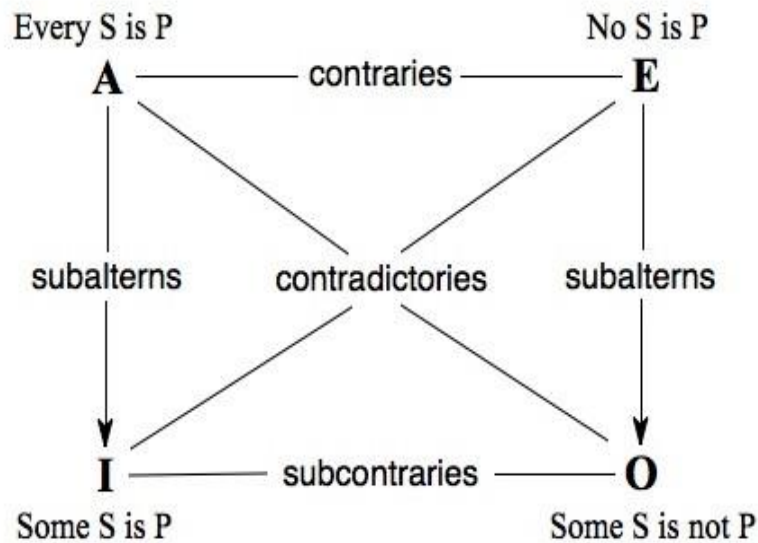
Another kind of assertion that has no place in serious argumentation is prejudice, a half-baked opinion based on insufficient or unexamined evidence (for example, women are bad drivers). Unlike a belief, a prejudice is testable, it can be contested and disapproved on the basis of facts. We often form prejudices or accept them from others, such as family, friends, media and so on without questioning their meaning or testing their truth.

Belief

Unlike an opinion, a belief is a conviction based on cultural or personal faith, morality or values. Statements such as 'capital punishment is a legalized murder' are often called opinions because they express viewpoints, but are not based on facts or other evidence. They cannot be disapproved or even contested in a rational or logical manner. Since beliefs are inarguable, they cannot serve as the thesis of a formal argument.

SQUARE OF OPPOSITION

The square of opposition is a diagram representing the relations between the four basic categorical propositions. The origin of the square can be traced back to Aristotle making the distinction between two oppositions: contradiction and contrariety.



Contradictory: two propositions are called contradictory if they cannot both be true and they both be false. In other words the statements have opposite truth value.

Q. All birds are cat which of the following is the contradictory

Some birds are cat.

No birds are cat.

Some birds are not cat.

Q. Which is the contradictory of No meter maids are Cia agent

Contraries: two propositions are contraries if they cannot both be true but they might be false.

Q. If statement No book is table is true then which statement would be false

Some books are table

Some books are not table

All books are table

Some tables are book

Sub contrary: two propositions are sub contraries if they cannot both be false but they might be true.

Q. If "some bags are flowers is False", then which would be the true statement.

All bags are flowers

Some bags are not flowers

No bags are flowers

Subalterns: truth follows downward

False upward

Q. If "All bananas are apple is true then which of following statement would be true

- . Some bananas are not apple
- . Some apples are banana
- . Some bananas are apple

INDUCTIVE REASONING

Inductive Reasoning is a process to generalized decisions after making observations and repeated specific instance of something.

- Specific to general

Eg. Dog eats to survive.

Cat eats to survive.

Cow' eats to survive.

Conclusion All Animals eat to survive

Argument:- An argument is a set of statements one of which (the conclusion) is taken to be supported by the remaining statement (the premises)

Characteristics:-

- ❖ Moves from specific observations to general claims.
- ❖ Seeks to reduce uncertainty of claim.
- ❖ Informal/probability/ reasonably/ likely/ possibly true.
- ❖ The conclusion can be based on various things like analogy, casual relationship or prediction.

Q. Given below are the same characteristics of logical argument select a code which is express a characteristic which is not inductive in character?

Options are

- a. Conclusion is based on observation and experiment
- b. Conclusion conclusively follows from its premise
- c. The conclusion is based on casual relation.
- d. The conclusion is claimed to follow from its premise.

TYPES OF INDUCTIVE ARGUMENTS:

There are six types of inductive arguments.

1. Reasoning by generalization:- conclusion follows from premises based on inferring a sample to large population.

e.g. Out of 1000 poor people we take a sample of 100 Poor people and make a Conclusion that all poor people are suffering from malnutrition.

2. Prediction:- conclusion follows from premises based on inferring that the present or future will resemble the past.

e.g. In dec 2018, net exam level was tough so in June 2019, it will be going to be tough again.

3. Casual inference:- conclusion follows from premises based on inferring a cause/effect relationship.

- e.g. The water bottle is in the fridge from last night

So the bottle will be chilled now.

I hear the sound of piano, so someone is playing piano.

4. Argument from authority :- conclusion follows from premises based on the assumed through accurately because claims of an expert.

e.g. A cricket expert inspect pitch and say it is not a scoring pitch then we accept it as true.

5. Argument from sign:- conclusion follows the premises based on assumed truth or accuracy of intended communication, but no expertise.

Ram is sneezing.

Ram keeps coughing.

Ram must be sick.

6. Argument from Analogy:- conclusion follows from premises based on inferring further similarity from known similarity.

- e.g.

Q. If a large diamond cut up into little bits, it will loss its value just as an army is divided up in to small units of soldiers, it losses it strength.

- A. Analogical argument
- B. Deductive argument
- C. Statistical argument
- D. Casual argument

FORCE OF ARGUMENT

Strong Argument:- an argument is called to be strong if premises are true, the conclusion is very likely to be true.

eg. Most of male singer become Indian idol

Salman is a male singer contestants

Therefore salman probably win the title.

Weak Argument:- an argument is called to be weak if all the premises are true but conclusion intended to be true but is infact weak.

Eg. Most of male singer become Indian idol

Salman is a male singer contestants

Therefore Kirti probably win the title.

Cogent Argument:- an argument is called to be cogent if Strong has all true premises. **Uncogent Argument:-** an argument is called to be uncogent if it either strong but had atleast one premise false Or Was weak to begin with Overlook important evidence that would lead another conclusion.

e.g. Most of male singer become indian idol

Salman is a female singer contestants

Therefore salman probably win the title.

DEDUCTIVE REASONING

Deductive reasoning is a type of logic in which one goes from general statement to specific instance.

e.g. All men are mortal.

Ram is man.

Therefore, Ram is mortal.

Syllogism is a part of deductive reasoning.

Characteristics of Deductive Argument

- If the premises are true then the conclusion must be true
- The conclusion follows necessarily from the premise.
- The premise provide conclusive evidence for the truth conclusion.
- It is impossible for the premise to be true and the conclusion false.
- It is logically inconsistent to assert the premise and deny the conclusion, meaning that if you accept the premise, you must accept the conclusion.

ANALOGIES

If the relationship between one pair of words is similar to another pair of words then we say that both the pair of words is analogous to each other. In simple words, the relationship between two words must be same for other words associated with them too.

For Example –

Devotee: Temple and Patient: Hospital is a parallel pair of words because they have similar kind of relationship between them. As devotees go to temple; patients go to hospital.

Note – In this section we have to analyze the relationship between two given pairs and find the relationship between other two pairs among which one is given in the question and other one will be present in the options.

Types of Analogy

Analogy can be categorized into following two types –

- ❖ Words Analogy
- ❖ Number Analogy

Word analogy again can be reclassified into following two sections –

- ❖ Meaningful Words
- ❖ Non- Meaningful Words

Kinds of Word Relationship

First find the relationship between the two given words and once you find that, go for finding the similar relationship word for the asked word from the given options.

Opposite Relationship

If two given pairs are opposite in meaning to each other, similar kind of relationship has to be chosen for the question pair from the given options.

For Example –

Kinetic : Potential

Fat : Thin

Synonymous Relationship

The two words of the question pairs are similar in meaning and that relationship has to be found among the words given in the answer choice word pair.

For Example –

Huge : Big

Slim : Thin

Cause and Effect

Here if one word will be the cause then other will be its effect.

Fire : Death

Fasting : Starvation

Worker and Article Relationship

Here the relationship is about the maker or producer with its production.

For Example –

Writer: Novel

Artist: Painting

Worker and Tool Relationship

Relationship is among a particular class of people and the tools used by them

For Example –

Student: Pen

DTP Operator: Computer

Tool and Object Relationship

It describes the relationship between the tool and its corresponding object.

Paint: Wall

Knife: Vegetables

Similarly some other similar kinds of analogies are –

- ❖ Whole and part analogy
- ❖ Intensity relationship
- ❖ Classification relationship
- ❖ Functional analogy
- ❖ Gender analogy
- ❖ Sequential analogy
- ❖ Quantity and unit analogy
- ❖ Utility analogy
- ❖ Symbolic analogy
- ❖ Association analogy
- ❖ Age analogy
- ❖ Characterization analogy etc

Important types of Analogy**Synonym Based Analogy**

In such type of analogy two words have similar meaning.

Examples:

Big: Large	Huge : Gigantic
Endless : Eternal	Thin : Slim

ANTONYM BASED ANALOGY

In such type of analogy the two words of the question pair are opposite in meaning.

Examples:

Poor : Rich	Fat: Slim
Tall: Short	Big: Small
Light : Dark	Avoid : Meet

Tool & Object Based Analogy

This establishes a relationship between a tool and the object in which it works.

Examples:

Pencil : Paper	Pen : Paper
Scissors : Cloth	Saw : Wood
Eraser : Paper	Filter : Water

Worker & Tool Based Analogy

This establishes a relationship between a particular tool and the person of that particular profession who uses that tool.

Examples:

Writer : Pen	Painter : Brush
Cricketer : Bat	Blacksmith : Hammer
Barber : Scissors	Hunter : Gun

Worker & Product Based Analogy

This type of analogy gives a relationship between a person of particular profession and his/her creations.

Examples:

Batsman : Run	Writer: Book
---------------	--------------

Causes & Effect Based Analogy

In such type of analogy 1st word acts and the 2nd word is the effect of that action.

Examples:

Work : Tiredness	Bath : Freshness
Race : Fatigue	Shoot : Kill
Infection : Disease	Food : Energy

Gender Based Analogy

In such type of analogy, one word is masculine and another word is feminine of it. In fact, it is a 'male and female' or 'sex' relationship.

Examples:

Man : Woman	Boy : Girl
Nephew : Niece	Bull : Cow
Duck : Drake	Lion : Lioness

Classification Based Analogy

This type of analogy is based on biological, physical, chemical or any other classification. In such problems the 1st word may be classified by the 2nd word and vice-versa.

Examples:

Cow : Animal	Girl : Human
Oxygen : Gas	Water: Liquid
Snake : Reptile	Parrot: Bird

Function Based Analogy

Singer : Sings	General : Commands
Player : Plays	Surgeon : Operates
Spoon : Feed	Microscope : Magnify

Quantity and Unit Based Analogy

In such type of analogy 2nd word is the unit of the first word and vice-versa.

Examples:

Distance : Mile	Mass : Kilogram
Length : Meter	Force : Newton
Power : Watt	Temperature : Degree

Product & Raw Material Based Analogy

In such type of analogy the 1st word is the raw material and 2nd word is the end product of that raw material and vice-versa.

Examples:

Yarn : Fabric	Milk : Curd
Flour : Bread	Latex : Rubber
Grape : Wine	Fruit : Juice

Utility Based Analogy

In such type of analogy the 2nd word shows the purpose of the 1st word or vice-versa.

Examples:

Pen : Writing	Food : Eating
Chair : Sitting	Bed : Sleeping

Symbolic relationship based analogy

In such type of analogy, the 1st word is the symbol of the 2nd word and vice-versa.

Examples:

White : Peace	Red : Danger
Black : Sorrow	Red Cross : Hospital
Swastika : Fortune	Yellow : Flood

Adult & Young one Based Analogy

In such type of analogy, the 1st word is the adult one and 2nd word is the young one of the 1st word or vice-versa.

Examples:

Cow : Calf	Human : Child
Dog : Puppy	Duck : Duck ling
Goat : Kid	Tiger : Cub

Subject & Specialist Based Analogy

In such type of analogy the 2nd word is the specialist of 1st word (subject) or vice-versa.

Examples:

Heart : Cardiologist	Skin : Dermatologist
Pediatrics : Children	Ophthalmologist : Eye
Geologist : Earth Science	

Instrument and Measurement Based Analogy

We see in this type of analogy, the 1st word is the instrument to measure the 2nd word and vice-versa.

Examples:

Hygrometer : Humidity	Barometer : Pressure
Thermometer : Temperature	Sphygmomanometer : Blood pressure

Individual & Group Based Analogy

Second word is the group of 1st word (or vice-versa) in such type of analogy.

Examples:

Cow : Herd	Sheep : Flack
Grapes : Bunch	Singer : Chorus

State & Capital Based Analogy

1st word is the state and 2nd word is the capital of that state (1st word) (or vice-versa) in the analogy.

Examples:

Bihar : Patna	West Bengal : Kolkata
Maharashtra : Mumbai	Karnataka : Bangluru

Capital & Country Based Analogy

Examples:

Rome : Italy
Lima : Peru

Worker and Working Place Based Analogy

In this type of analogy the 1st word represents a person of particular profession and 2nd word represents the working place of that person (1st word) and vice-versa.

Examples:

Doctor : Hospital	Clerk : office
Cook : Kitchen	Professor : College
Teacher : School	Lawyer : Court

Topic Study Based Analogy

1st word is the study of the 2nd word (or vice-versa) in the analogy.

Examples:

Birds : Ornithology	Earth quakes : Seismology
Botany : Plants	Zoology : Animals
Mycology : Fungi	Histology : Tissues

Trophy and Game Based Analogy

Examples:

Ranji Trophy : Cricket	Dhyan chand Trophy : hockey
------------------------	-----------------------------

Product and Raw Material Based Analogy

Examples:

Metal : Ore	Bread : Flour
Curd : Milk	Wine : Grapes
Butter : Milk	Wall : Brick

Individual and Group/class

Examples:

Man : Crowd	Flowers : Bouquet
Fish : Shoal	Sheep : Flock
Cattle : Herd	Singer : Chorus

Organ & Disease**Examples:**

Liver : Jaundice	Eye : Cataract
Kidney : Stone	

VENN DIAGRAM

A **Venn diagram** (also called **primary diagram**, **set diagram** or **logic diagram**) is a diagram that shows all possible logical relations between a **finite collections** of different sets. These diagrams depict elements as points in the plane, and sets as regions inside closed curves. A **Venn diagram** consists of multiple overlapping closed curves, usually circles, each representing a set. The points inside a curve labelled S represent elements of the set S , while points outside the boundary represent elements not in the set S . This lends to easily read visualizations; for example, the set of all elements that are members of both sets S and T , $S \cap T$, is represented visually by the area of overlap of the regions S and T . In **Venn diagrams** the curves are overlapped in every possible way, showing all possible relations between the sets. They are thus a special case of **Euler diagrams**, which do not necessarily show all relations. Venn diagrams were conceived around **1880** by **John Venn**. They are used to teach elementary set theory, as well as illustrate simple set relationships in probability, logic, statistics, linguistics, and computer science.

Group and Venn diagram-:

A group consists of many with similar facts. This group can be represented by a venn diagram. The diagram is always a closed one. Inside the diagram, there may be some diagram that symbolizes facts about that group. There is no direct relation between the sizes of the shapes.

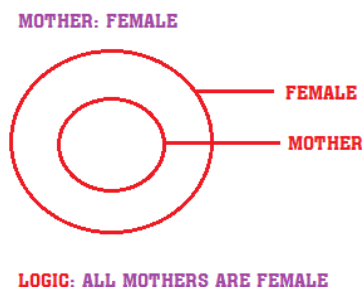
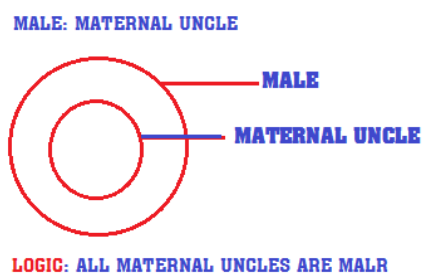
Relation of Groups between Each Other:

In questions of vein diagram, facts are very important. All the groups are related to each other on the basis of facts and not on each other's relations.

The relation between groups are of following types:

1. Relation between two groups.
2. Relation between three groups.

Relation between Two Groups If all relation between two groups are understood, then it will help in understanding the relation between three groups also.

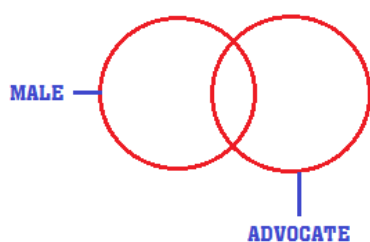
EXAPMLE

Note: When a group consists of a relation (maternal uncle, brother, etc.) and the second word in the group is a male or a female, then it is in either completely related group or completely non-related group.

Partly Related Group

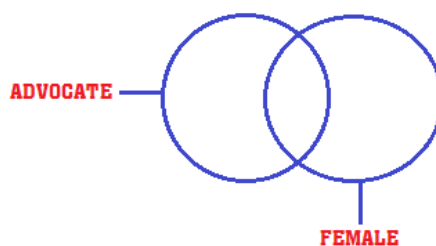
EXAMPLE-2

Male: Advocate



Logic: Some males are advocate or some advocates are male because advocates can be both males and females.

Advocate: Women



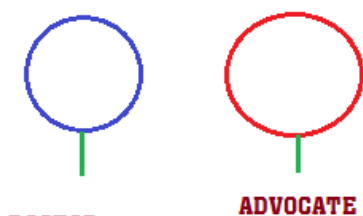
Logic: Some females are advocates or some advocates are females because advocates can be both male and female.

Note: Some professions, such as, doctor, engineer, advocate etc are perused by both male and female group, so such, relation are in partly related and not in completely related groups.

Completely Non-Related Group

When any of the group is not related to each other then it is said to be completely non-related groups.

Doctor: Advocate



Logic: Both are different profession

Female: Male



Logic: None of the females are male

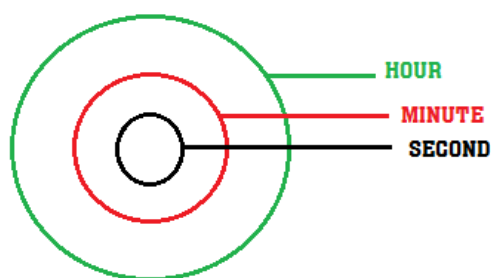
Relation Between Three Groups:

Relation between three groups can be of the following types – (Questions on relation between three groups can be solved in the same way as it is done in relation between two groups.)

TYPE-1:

In this, one group is related to the second group and the second group is related to the third group.

Example 1: Hour: Minute: Second

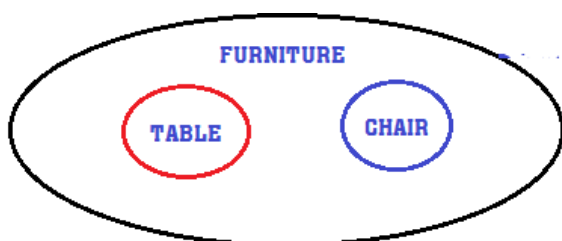


Logic: Seconds make minute and minutes make hour.

TYPE -2:

When two groups are completely related to the another group but those two groups are completely not related to each other

Example 2: Table: Chair: Furniture

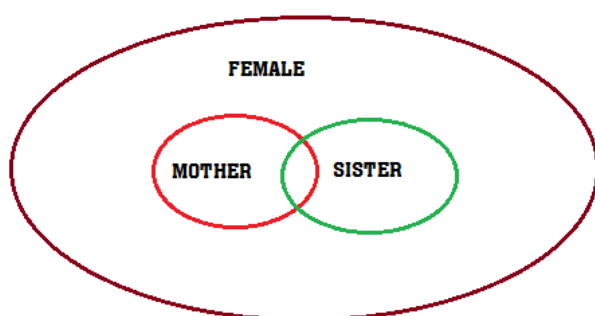


Logic: None of the tables are chair but both table and chair belong to the group – furniture.

TYPE -3:

When two groups are completely related to each other but both are partly related to another group

Example 3: Female: Mother: Sister

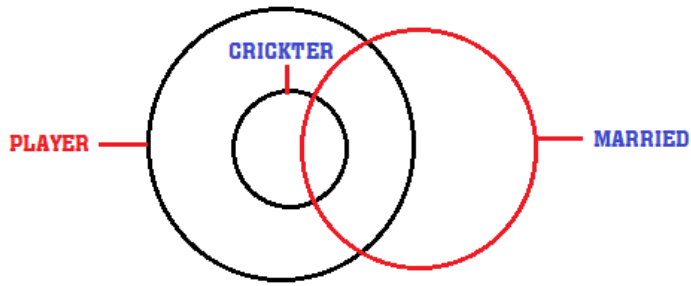


Logic: Some mothers are sisters and some sisters are mothers but mother and sister are in the group of females.

TYPE-4:

When one group is completely related to another group but are partly related to the third group

Example 4: Player: Cricketer: Married

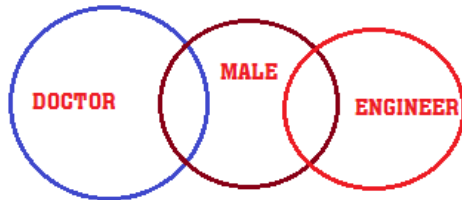


Logic: All cricketers are players. Some cricketers and some players of other games are married.

TYPE-5:

When first group is purely related to the second group and the second group is related to the third group but the first and the third group are not related to each other.

Example: 5 Male: Doctor: Engineer

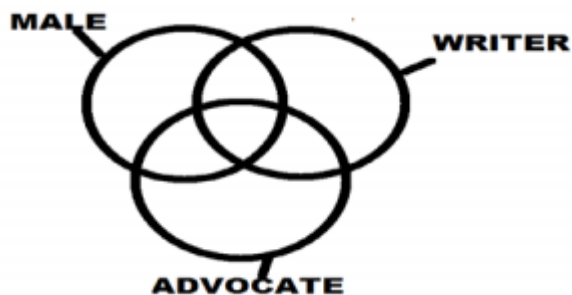


Logic: Some males are doctor and some males are engineer but none of the doctors are engineers.

TYPE-6:

All three groups are partly related to each other.

Example 6: Male: Advocate: Writer

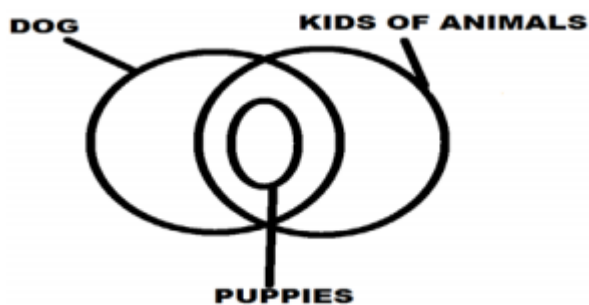


Logic : Some males are advocate, some males are writer, some advocates are writers and some males are both advocate and writer.

TYPE-7:

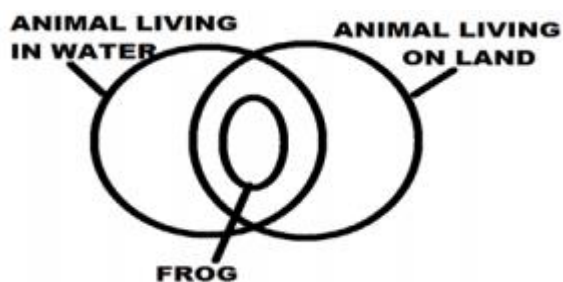
Two groups are partly related to each other but the third group is completely related to each other.

Example 7: dogs: Puppies: Kids of animals



Logic: All the puppies are included in dogs and all puppies are included in kids of animals.

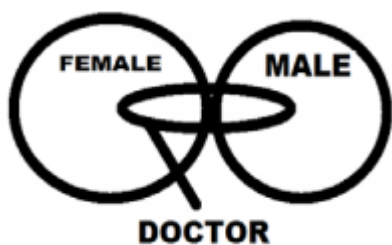
Example 8: Animal living in water: Animal living on land: frog



TYPE-8:

Two groups that are completely not related to each other but the third group is partly related to both the groups.

Example: 9: Female: Male: Doctor

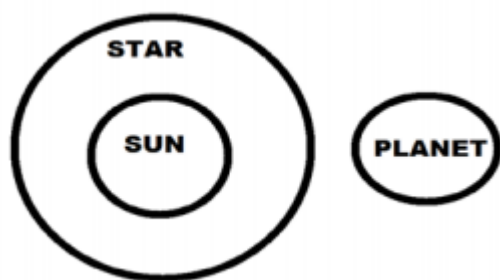


Logic: Doctors are both, male and female and male and females are two separate groups.

TYPE-9:

One group is completely related to another group but the third group is completely not related to both the groups.

Example 10 Sun : Star : Planet

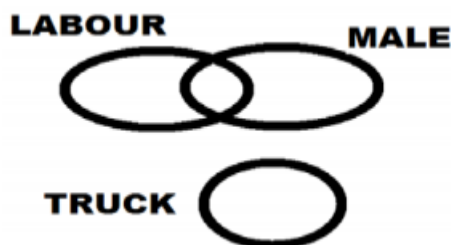


Logic Sin is a star but planet is different

TYPE-10 :

Two groups are partly related to each other but the third group is completely different from both the groups.

Example: 11: Male: Labour: Truck



SYLLOGISM

Syllogism is a form of deductive reasoning where you arrive at a specific conclusion by examining two other premises or ideas. Syllogism derives from the Greek word syllogism's, meaning conclusion or inference.

Some syllogisms contain three components:

- Major Premise
- Minor Premise
- Conclusion

For Example: All roses are flowers (**major premise**). This is a rose (**minor premise**). Therefore, I am holding a flower (**conclusion**).

Types of Syllogism

The type of **syllogism** that typically contains these **three components** is categorical **syllogism**. However, there are **two** other major kinds of syllogism. We'll discuss each one here, plus enthymemes and syllogistic fallacy.

Categorical Syllogism

As we know, our first **example** about roses was a categorical **syllogism**. Categorical syllogisms follow an "If A is part of C, then B is part of C" logic.

Let's look at some more examples.

All cars have wheels. I drive a car. Therefore, my car has wheels.

- ❖ Major Premise: All cars have wheels.
- ❖ Minor Premise: I drive a car.
- ❖ Conclusion: My car has wheels.

All insects frighten me. That is an insect. Therefore, I am frightened.

Major Premise: All insects frighten me.

Minor Premise: That is an insect.

Conclusion: I am frightened.

Conditional Syllogism: Conditional syllogisms follow an "If A is true, then B is true" pattern of logic. They're often referred to as hypothetical syllogisms because the arguments aren't always valid. Sometimes they're merely an accepted truth.

If Katie is smart, then her parents must be smart.

- ❖ Major premise: Katie is smart.
- ❖ Conclusion: Katie's parents are smart.

If Richard likes Germany, then he must drive an Audi.

- ❖ Major premise: Richard likes Germany.
- ❖ Conclusion: He must like all things German, including their cars.

Disjunctive Syllogism: Disjunctive syllogisms follow a "Since A is true, B must be false" premise. They don't state if a major or minor premise is correct. But it's understood that one of them is correct.

- ❖ Major Premise: This cake is either red velvet or chocolate.
- ❖ Minor Premise: It's not chocolate.
- ❖ Conclusion: This cake is red velvet.

Major Premise: On the TV show Outlander, Claire's husband is either dead or alive.

Minor Premise: He's not alive.

Conclusion: Claire's husband is dead.

Enthymemes

An enthymeme is not one of the major types of syllogism but is what's known as rhetorical syllogism. These are often used in persuasive speeches and arguments.

Generally, the speaker will omit a major or minor premise, assuming it's already accepted by the audience.

He couldn't have stolen the jewelry. I know him.

- ✓ Major Premise: He couldn't have stolen the jewelry.
- ✓ Minor Premise: I know his character.

Her new purse can't be ugly. It's a Louis Vuitton.

- ✓ Major Premise: Her new accessory can't be ugly.
- ✓ Minor Premise: It's made by famous designer Louis Vuitton.

In an enthymeme, one premise remains implied. In the examples above, being familiar with someone or something implies an understanding of them.

Syllogistic Fallacy

Some syllogisms contain false presumptions. When you start assuming one of the major or minor premises to be true, even though they're not based in fact - as with disjunctive syllogisms and enthymemes - you run the risk of making a false presumption.

All crows are black. The bird in my cage is black. Therefore, this bird is a crow.

- ✓ **Major Premise:** All crows are black.
- ✓ **Minor Premise:** The bird in my cage is black.
- ✓ **Conclusion:** This bird is a crow.

The scenery in Ireland is beautiful. I'm in Ireland. Therefore, the scenery must be beautiful.

- ✓ **Major Premise:** The scenery in Ireland is beautiful.
- ✓ **Minor Premise:** I'm in Ireland.
- ✓ **Conclusion:** The scenery is beautiful.

Of course, not every black bird is a crow and not all of Ireland is beautiful. When preparing a speech or writing a paper, we must always make sure we're not making any sweeping generalizations that will cause people to make false presumptions.

Rules of Syllogism

There are **six known rules of syllogism**. However, they mainly apply to categorical syllogism, since that is the only category that requires three components: major premise, minor premise, and conclusion. Here are six rules that will ensure you're making a strong and accurate argument.

- ❖ **Rule One:** There must be three terms: the major premise, the minor premise, and the conclusion - no more, no less.
- ❖ **Rule Two:** The minor premise must be distributed in at least one other premise.
- ❖ **Rule Three:** Any terms distributed in the conclusion must be distributed in the relevant premise.
- ❖ **Rule Four:** Do not use two negative premises.
- ❖ **Rule Five:** If one of the two premises are negative, the conclusion must be negative.
- ❖ **Rule Six:** From two universal premises, no conclusion may be drawn.

VALIDITY AND SOUNDNESS

Validity: A deductive argument is either valid or invalid.

A deductive argument is valid if the conclusion follows necessarily from the premises: If it is necessarily the case that if the premises were to be true, then the conclusion must true (whether it is in fact true or not).

If there is any possibility that the all the premises could be true and the conclusion false, the argument is invalid.

NOTE: The truth of the premises is not required for validity.

CHARACTERISTICS OF DEDUCTIVE REASONING

Deductive arguments are not spoken of as "true" or "false," but as "sound" or "unsound." A sound argument is one in which the premises guarantee the conclusions, and an unsound argument is one in which the premises do not guarantee the conclusions. Deductive Reasoning never leads to new information.

CHARACTERISTICS OF INDUCTIVE REASONING

Unlike deductive reasoning, Inductive reasoning is not designed to produce mathematical certainty. Induction occurs when we gather bits of specific information together and use our own knowledge and experience in order to make an observation about what must be true.

Inductive reasoning does not use syllogisms, but series of observations, in order to reach a conclusion.

- Bases on personal Believes
- Inductive logic studies the way in which a premise may support a conclusion without entailing it (involve (something) as a necessary or inevitable part or consequence).

Types of Arguments

1. Deductive Argument: When an argument has the purport of proving its conclusion necessarily from the premises. An argument is deductive if its purport is that it is impossible that its premises be true and its conclusion false.

2. Inductive Argument: When an argument has the purport of showing its conclusion to be likely or probable given the premises. An argument is inductive if its purport is merely that it is improbable that its premises be true and its conclusion false.

Properties of Deductive Arguments: The conclusion follows, or thought to follow necessarily from the premises. In drawing its conclusion, the argument employs such words as "necessarily," "certainly," or "absolutely," it is usually best regarded as deductive.

Properties of Inductive Arguments: The words such as "probably," "likely," or "plausibly" are employed.

Narrative Argument

A narrative essay is one that uses a story, usually presented in chronological order, to make some kind of point. When you are writing a narrative argument, that point is persuasive or argumentative.

Example:

Maybe you want to write an argument about climate change but know your audience is emotional about the topic. Instead of presenting statistics, you tell the story of one geographic location that has experienced some negative effects of climate change. You tell the story of the people who have been impacted.

Conjecture

In mathematics, a conjecture is a conclusion or proposition based on incomplete information, for which no proof has been found.

An **historical argument** gives reasons for holding a certain opinion about an event in the past. A **statistical syllogism** (or proportional syllogism or direct inference) is a non-deductive syllogism. It argues, using inductive reasoning, from a generalization true for the most part to a particular case.

Statistical Arguments: Which we can test, measure, experiment. One of most important forms of **scientific reasoning**, and the foundation of causal reasoning, is the statistical argument.

Example: Researchers wanted to know whether 3-D movies cause motion sickness or headaches in a significant number of people who watch them.

Biological determinism or **genetic determinism** is the belief that human behaviour is controlled by an individual's genes or some component of their physiology, generally at the expense of the role of the environment, whether in embryonic development or in learning.

INDIAN LOGIC

The development of **Indian logic** dates back to the anviksiki of **Medhatithi Gautama** (c. 6th century BCE) the **Sanskrit grammar rules of Pāṇini** (c. 5th century BCE); the **Vaisheshika** school's analysis of **atomism** (c. 6th century BCE to 2nd century BCE); the analysis of inference by Gotama (c. 6th century BC to 2nd century CE), founder of the Nyaya school of Hindu philosophy; and the tetralemma of Nagarjuna (c. 2nd century CE).

Indian logic stands as one of the **three original traditions of logic**, alongside the Greek and the Chinese logic. The Indian tradition continued to develop through to early modern times, in the form of the Navya-Nyāya school of logic.

Logic is the study of inference and argument. The logic and theory of knowledge of Indian systems are largely coloured by their metaphysical tenets. Philosophy basically deals with interpretation of man and nature. It is the analysis, assessment and exposition of the process of knowledge.

As per Indian logic system, knowledge is first received through perception (pratyaksa) or comparison (upamana).

Indian logic (Means of Knowledge)

Orthodox (Aastik) Vedas

1. Nyana philosophy.
2. Vasisheshika
3. Mimansa/purva mimamsa
4. Sankhya philosophy
5. Yoga philosophy
6. Uttara mimamsa (Vedanta)

Unorthodox (Naastik) Non vedas

1. Buddhist
2. Jainism
3. Chaevaka (materialists)

In India, there are six orthodox schools of philosophy which recognise the authority of Vedas as divine revelation. Those who did not recognise this authority were the Jains, Buddhists and Charvaka (materialists).

There is much divergence of opinion among Indian philosophers concerning the nature and scope of Pramana (source of knowledge).

Indian philosophy divides itself into three periods

1. Vedic period.
2. Upanishadic period
3. Post-vedic period.

The post **Vedic period** is a systematic period which saw the development of '**orthodox systems**'. Currently, we are starting with **Charvaka system**.

Charvaka Materialist School's views of knowledge

Rishi Brihaspati probably as the founder of the school. **Charvaka** is also called **Lokayata**, the Sanskrit word valid knowledge. Only direct **perception (anubhava)** is recognised. What we cannot perceive through senses must be treated as non-existent. They refute all other sources of knowledge no mind, no consciousness and then no soul. Only physical body is real.

There are **four traditional elements of earth**, water, fire and air. The validity of inference is also rejected by **Charvakas**. Inference is considered to be a mere leap into the dark.

We proceed from the known to the unknown and there is no certainty in this, though some inferences may turn out to be accidentally true. Induction is uncertain and deduction is argument in a circle. Deductive inference is vitiated by the fallacy of petition principia.

Though we consider invariable association or Vyapti as the nerve of all inference, charvakas challenges this guess work and regards it just as a guess work. Perception does not approve this Vyapati. Inference and testimony does not approve it.

Charvaka review perception is valid and inference is invalid itself is the result of inference.

The creations such as Kautilya's Arthashastra (science of material gain) are based on it as it is considered to be a hedonist opportunist approach.

Orthodox Views of Knowledge

The Nyana and Vaishesika schools are primarily analytic and are therefore, more concerned with logic and epistemology than ethics.

Nyaya School

It was formed during 4th century **BC by Gautama**. Here, the knowledge comes from **perception**, inference, comparison and verbal testimony.

Objects of learning are self, body, sense, organs, sense objects, intellect, mind and activity. It is an orthodox system of atomistic pluralism and logical realism. It invented a science of knowledge (**Pramanasastra**). If a means of knowledge is impossible, then denial of it would also be impossible. If denial is based on a means of knowledge, then the validity of means have to be acknowledged.

It has explored remarkably the domain of cognitive consciousness and determined the process by which it enters into a connection with the world of physical objects.

The outside world is known to us through the senses and the mind. It believes in the external things as reflecting their real nature when knowledge is true and their unreal nature when knowledge is false.

Knowledge is the knowledge of things and it constitutes the expression of reality (arthubhava). Whatever its type, it is a natural response to the disposition present in human mind.

In the Nyaya philosophy, knowledge is termed as the manifestation of object. Knowledge lights its objects as does a lamp. Knowledge may be valid or invalid. Valid knowledge (prama) is defined as the right apprehension of an object. It is the manifestation of an object as it is.

Nyaya maintains the theory of correspondence. While Nyaya system recognises all the four Pramanas, namely perception, inference, verbal testimony and comparison, Vaishesika recognises only two Pramanas- perception and inference and reduces comparison and verbal testimony to inference.

Vaishesika Philosophy

Nyaya system is allied to be the **Vaishessika** systems, which developed metaphysics and ontology. The Vasihesika sutras are the oldest ones, and were written by Kannada, shortly before Gautama's Nyaya Sutras.

The word **Vishesa** means particularly and emphasizes the significance of individuals. It recognises three real objects of experience as substance, quality and activity.

There are **three** products of intellectual discrimination, which are generality, particularity and combination. Like the Nyaya School, this school also acknowledges perception, inference, comparison and verbal testimony as the valid sources of knowledge.

Mimamsa

Mimamsa literally means 'revered thought' and was originally applied to the interpretation of the Vedic rituals, which commanded highest reverence.

It is also very ancient and **Mimamsa** Sutra by **Jamini** was written during 4th century B.C.

A cognition which apprehends an object cannot be intrinsically invalid. Memory arises from the impression of a priori cognition.

Kumarila defines valid knowledge is free from causes from defects and which is not contradicted by subsequent knowledge.

A valid cognition must fulfil four conditions.

1. It must not arise from defective causes.
2. It must be free from contradiction. It must be self-consistent and should not be set aside by subsequent knowledge.
3. Novelty is an essential feature of knowledge. Memory is excluded from valid knowledge.
4. It must truly represent the object.

Here, all knowledge is valid by itself. It is not validated by any other knowledge. It is not due to any extraneous conditions. A need for explanation is felt only when knowledge fails. If a rope is mistaken for a snake, the knowledge of the rope snake is invalidated by the subsequent knowledge of the rope.

Truth is normal and error is abnormal. Belief is natural and disbelief is an exception. According to Badrayana, knowledge comes from the scriptures and other authorities. Scripture refers to the Vedas and Smriti to the Bhagavad Gita, Mahabharata and Laws of Manu.

According to Sankhya, both the validity and the invalidity of knowledge are self-evident. Whatever manifests itself at any time has all along been hidden there.

Other Heterodox School of Knowledge

Jainism and Buddhism did not recognise the authority of Vedas as the orthodox system of philosophy, they are considered as the heterodox schools of philosophy.

Jainism

Jainism has critically examined the valid sources of knowledge. Here, knowledge is of two kinds and they are as follows.

1. **Pramana**: it refers to the knowledge of a thing as it is.
2. **Naya** or knowledge of a thing in its reflection. It means the standpoint of thought from which we make a statement about a thing. All truth is relative to our standpoint. Partial knowledge of one of the innumerable aspects of a thing is called 'naya'.

Both Pramana and Naya are essential for the full and true knowledge of a thing.

Jains classify knowledge gained through Pramana into direct (aparoksa) and indirect (paroksa).

1. **Immediate (Aparoksa)**: Avadhi, Manahpariyaya and Kevala.
2. **Mediate (Paroksa)**: Mati and Shruta.

In immediate knowledge, Avadhi is clairvoyance, Manah-pariyaya is telepathy and Kevala is omniscience. Avadhi and manah-pariyaya are immediate and limited forms of knowledge, while kevala is unlimited and absolute knowledge.

Mediate knowledge is divided into mati and shruta. Mati includes both perception and inferential knowledge. Shruta jnana means knowledge derived from authority. It is to be gained from authoritative books and words of great sages. Perusal of authoritative books and listening to the sermons of saints are essential for this kind of knowledge.

Perception knowledge is ordinarily called as immediate, thus admitted to be relatively so by Jainism. Therefore, it is included in mediate knowledge. Pure perception in the sense of mere sensation cannot rank the title of knowledge. It must be given meaning and arranged into order by conception or thought. Perceptual knowledge is therefore regarded as mediate since it presupposes the activity of thought. Mediate knowledge is divided into mati and shruta. Mati includes both perceptual and inferential knowledge.

According to Jaina epistemology indirect knowledge is of five kinds- Smṛti (valid knowledge), Pratyabhijñā (recognition), Tarka (logic), Anumāna (inference) and Āgama (words of reliable people).

Here, we can discuss two important aspects. Naya vada means a standpoint of thought from which we make a statement about a thing. All truth is relative to our standpoints. Partial knowledge of one of the innumerable aspects of a thing is called Naya.

Syad vada or saptabhangi Naya is the most important part of Jaina logic. According to this, we can know only some aspects of reality and so all our judgements are relative. It is a theory of the relativity of knowledge.

Buddhism

In epistemological ideas, we can see the different opinions among the four schools of Buddhism.

1. Yogacara
2. Madhyamika
3. Sautrantika
4. Vaibhasika

Sautrantika says that the external objects are not known through perception. According to Vaibhasika says that the knowledge of the external objects can also be gained through perception.

According to Vaibhasika, the inference of things external to knowledge is self-contradictory. If all the external objects are inferred by their knowledge, then nothing can be known by perception. In the absence of perception there can be no relation of concomitance between the major and the minor premise without no inference is possible. This is opposes to actual experience.

The **vaibhasikas** accept the presence of the external things and conceive them as subject to perception. To them by **Pramanas** are two tyoes, namely Pratyaksa (perception) and anumana (inferential). Both these Pramanas are known as samyagjnana (right knowledge) and it is by these that all the purusharthas are attained. Pratyaksa is the knowledge devoid of imagination and error. This knowledge is of four types and they are as follows.

1. Indriya jnana: knowledge through senses.
2. Mano vijnana; sensual knowledge in the form of samanantara pratyaya after the knowledge through senses.
3. Atma samvedana: it is the manifestation of chitta and its dharma are like pleasure and pain in their real form.
4. Yogic jnana: it is the ultimate knowledge of the things perceptible through various Pramanas.

Inference is of two types, such as Svārtha (for the self) and parārtha (for others). In the former, the linga is inferential that is in the inference there is fire on the hill, the hill is linga and the fire is inferential. In it the linga remains in self side (svapaksa), just as the kitchen. The linga does not remain in the opposite side (vipaksa), example a pool of water etc.

Comparison between JAINISM AND BUDDHISM

In fact, Buddhism and Jainism movements were started to reform the Hinduism. The languages spoken by the masses, such as Prakrit and Pali started getting prominence over Sanskrit, a language which was limited to priestly and aristocratic class. The source of both the religion is vedic religion and both are indebted to Upanishads.

Buddhism is centered upon the life and teachings of Gautama Buddha, whereas Jainism is centered on the life and teachings of Mahavira. Buddhism is a polytheistic religion and its main goal is to gain enlightenment. Jainism is also a polytheistic religion and its goals are based on non-violence and liberation the soul.

Buddhism says that this life is suffering and the only way to escape from this suffering is to dispel one's cravings and ignorance by practising the Eightfold path.

Jainism suggests to respect all living things. Attain liberation by avoiding and shedding of bad karma which is the cause of rebirths and all sufferings.

PRAMANA (SOURCE OF KNOWLEDGE)

The general science of inference is logic and its aim is to make explicit the rules by which inferences are drawn. Inferences are rule-governed steps from one or more propositions known as premises, to another proposition called conclusion. A deductive inference is one that is intended to be valid, where a valid inference is one in which the conclusion must be true if the premises are true. All other inferences are inductive.

Our discussion is primarily based upon **nyaya** system. **Vatsayana** defined a **Pramana** as a source or means of valid knowledge. **Gautama Nyaya** sutra defines perception as an awareness which is

produced from the connection between the sense organ and object, not produced by words, not deviating from its object that is it is always true and is of the nature of certainty.

There are four factors involved in any knowledge and they are listed below.

1. The subject who knows (pramata)
2. The object of knowledge (prameya)
3. The means of valid knowledge (pramana)
4. The resultant of valid knowledge (prama)

Knowledge can be termed as prama (valid) and aprama (invalid).

Hence, pramana is valid means of knowledge. It has four important means and they are listed below.

1. **Pratyaksa (perception)**
2. **Anumana (inference)**
3. **Upamana (comparison)**
4. **Shabda (verbal testimony)**

Here, a causal relation is discerned and ascertained between Prama and pramana on the basis of uniform agreement in presence and absence between the two. The former cannot arise without the latter and hence, it is maintained that the latter is the source or cause of the former.

Different schools of knowledge accept or reject different ones of these methods.

1. All methods are accepted by Mimamsa.
2. Only perception, inference and testimony by samkhya and yoga.
3. Only perception and inference by Buddhism and Vaisheshika.
4. Only perception by Charvaka.

PRATYAKSHA (PERCEPTION)

It is basically which is before one's eyes, 'aksa' means sense organ and 'prati' means the function of each sense organ. Perception is a valid form of knowledge produced by the contact of an object with a sense organ.

It is the first of the five means of knowledge or pramanas, that enable a person to have correct cognitions of the words.

Pratyaksha is of two kinds.

1. **Anubhava: direct perception**
2. **Smritu: remembered perception**

Some schools make a further distinction between indiscriminate perception (**nirvikalpaka**), the object is perceived without its distinguishing features. Indiscriminate perception is important to the followers of the Advaita (non-dualist) school of Vedanta, for it allows for the liberating perception of brahman (ultimate reality), which is without features. Discriminate perception (**savikalpaka**), in which the distinguishing features are both observed and recognised.

The knowledge arises by contact of sense organs (indriya) with an object. Such contact is not the sole condition of perception, but it is its distinctive feature or extraordinary cause (karana) of perception. The actual process is given below:

1. The self comes into contact with mind (manas)
2. The manas with the senses

3. The senses with the object

The function of a sense organ in respect to its own object is described in two ways, such as nature of contact and nature of knowledge.

Sense-object is also the instrumental cause of perception, as it immediately gives rise to the perceptual knowledge of that particular object.

The modern school of Nyaya gives a new definition of perception as it is direct or immediate cognition that is not derived through the instrumentality of any other cognition. It applies to all cases of perception, human cognition. It applies to all cases of perception, human or divine. Even God's omniscience has the highest degree of immediacy conceivable. It excludes inference, analogy and verbal testimony.

Perception is divided into the following two categories.

1. Ordinary (Laukika)
2. Extraordinary (Alaukika)

According to later logicians, there are two kinds of verbal testimony as given below.

1. Vaidika or Alukika: it is also known as divine or scripture.
2. Laukika or secular.

The former relates to the words of God. The vedas are created by God and therefore, valid perfectly. The latter relates to the words of trustworthy people.

According to Nyayikas, since human beings are not perfect, only the words of trustworthy people can be considered as Laukika shabda.

In ordinary perception, knowledge results from the contact of the sense organs with the external objects. Extraordinary perception has three distinctions, such as perception of classes (samanyalaksana), complication (jnana laksnana) and intuition (yogaja).

ANUMANA (INFERENCE)

Etymologically the word 'Anumana' indicates after knowledge (anu-after, mana- knowledge). It is second source of valid knowledge. The term anumana literally means 'after knowledge' that is knowledge that follows other knowledge. Inference is defined as the knowledge of an object due to a previous knowledge of some sign or mark.

Gautama defines it as a specific form of knowledge preceded by perception. The perception of the invariable relation between the proban (linga) and the probandum (lingi) is a previous perception of such a relation somewhere else. Again, there is a perception of the proban as invariably related to probandum as it exists in the locus.

SHABDA (VERBAL TESTIMONY)

According to Nyaya Philosophy, Shabda is the fourth and last valid source of knowledge. Shabda literally means verbal knowledge. The mere combination of words does not provide a valid knowledge.

All verbal statements are not valid. Hence, Gautama defines Shabda Pramana as the statement of a reliable person. In other words, verbal testimony is the communication from a trustworthy person- Who is a trustworthy person (apta) and why is assertion (uoadesa) is a testimony (prambna)?

Analysing the process of verbal testimony we get the following steps.

First, there is the perception of the words of a sentence uttered by a trustworthy person.

Second, there is the understanding of the meaning of words. This is called the Karana or the special cause of the verbal knowledge.

The knowledge of words leads to the knowledge of objects through the function of recalling the meaning of words.

Gautama and Vatsyayana stated in Nyaya School that verbal knowledge is of two kinds:

I. Drustartha or one relating to perceptible objects that means the sensible object attainable in this world.

II. Adrutartha or that relating to imperceptible objects that means the super-sensible object, which is attainable to the other world.

UPAMANA (COMPARISON)

Upamana is the combination of 'upa' and 'mana'. 'upa' means similarity or 'sadrusya' and 'mana' means cognition. Thus, upamana is the knowledge derived from similarity. It has been defined as the knowledge of relation between a person and its denotation. Upamana is the third source of valid knowledge.

For example, when we tell a city man that a wild cow is an animal like a cow and later on, in a forest, when he sees a wild cow he recognizes it as the wild cow. Then, his knowledge of the wild cow is the outcome of conjunction with the knowledge of the cow. Hence, the upamana is just the knowledge of the relation between a name (here it is the wild cow and the object denoted by that name (the actual wild cow seen in the forest)).

Mimansa treats **Upamana** as analogy. Buddhism does accept comparison as an independent source of valid knowledge.

According to Mimansa, the following two schools have also been identifies.

ARTHAPATTI (PRESUMOTION)

It is an independent source of knowledge. It is admitted as a distinct pramana which cannot be brought under anumana or sabda.

It consists in the assumption of some unperceived fact in order to explain apparently inconsistent facts. Let's take an example of arthapati. Devadatta is alive and he is not present in his house, we presume that he is elsewhere. The essential element in presumption is that a certain fact like Devadatta's being alive and 'not being present in his house' is unaccountable without presuming another fact like being outside his house. In presumption, we proceed from the knowledge of something to be explained to the knowledge of that which explains it. The means of presumption (karana) is the knowledge of the inner contradiction (anupatti) and its result is the reconciliation of the contradiction (upapatti). If devadatta is fat and he does not eat during day, we presume that he must be eating during night, otherwise the inconsistency between being fat and not eating during day cannot be resolved.

ANUPALABDHI (NON-APPREHENSION-MIMAMSA)

According to **Kumarila Bhatta** and others, non-apprehension as sixth independent source of knowledge consists in the preventative knowledge of negative facts. In other words, negative facts are cognized by a special instrument (**karana**) called non-apprehension.

Only positive facts are apprehended through positive sources like perception, inference etc but negative facts are apprehended through non-apprehension. For example, the absence of jar on the ground is apprehended through **anuplabdhi**.

Kumarila argued that the concept of the emptiness of the container inevitably presupposes non-existence. He also refutes the **Nyaya** view that non-apprehension is the same as perception or inference.

Negative is never perceived, for there is no sense-object contact in it.

STRUCTURE AND KINDS OF ANUMANA (INFERENCE)

Knowledge that comes after perception is inferential or relational and it is called inference. Anumana, etymologically means secondary proof. The data for inference are derived from perception and verbal testimony. There are two main groups of inference and they are as follows:

1. Vyapti: it is when universal relation such as between fire and smoke is known.
2. Paksadharmata: fire is inferred on the hill, where smoke is perceived in it.

Inference is mediate and indirect. That is arranged through the medium of some mark which is called 'hetu'. This may be explained with the help of the typical example of inference, the presence of fire on the perception of smoke. When one sees smoke on distant hill one remembers one's experience of the universal concomitance (**Vyapti**) between smoke and fire and concludes that there is fire on the distant hill.

Thus we can say that –

1. this hill has fire (**pratijna**)
2. Because it has smoke (**hetu**).
3. Whatever has smoke has fire, for example, an oven (**udaharana**)
4. This hill has smoke which is invariably associated with fire (**upanaya**).
5. Therefore this hill has fire (**nigamana**).

The first, the **pratijna**, is the logical statement which is to be proved. The second is **hetu** or reason which states the reason for the establishment of the proposition. The third is **udaharana** which the universal concomitance together with example. The fourth is **upanaya** or application of the universal concomitance to the present case. The fifth is **nigamana** or conclusion drawn from the preceding propositions. These five members of Indian syllogism are called **Avayavas**.

In the Aristotelian syllogism, the character which is inferred is called *sadhya*; the mark on the strength of which the character is inferred is the *hetu* (smoke); the subject where the character is inferred is *paksa* (hill). The three terms correspond to the major, the middle and the minor terms.

LINGA PARAMARSA: The Nyaya syllogism has five terms. Among them, middle term works as a bridge between the major and the minor terms. Therefore the middle term has main responsibility to prove a syllogism valid or invalid. How a middle term is related to major term is LINGA-PARAMARSHA. There are five characteristics of a middle term.

VYAPATI (INVARIABLE RELATION)

The word Vyapti literally means the state of pervasion. It implies a correlation between two facts, of which one is pervaded (vyapya) and the other pervades (vyapaka). A fact is said to pervade another when it always accompanies the other. A fact is said to be pervaded by another when it is accompanied by the other. In the given example, smoke is pervaded by fire, since it is always accompanied by fire. But while all smoky objects are fiery, all fiery objects are not smoky, e.g the red hot iron ball. Thus **Vyapti** is a relation of invariable concomitance between middle term and the major term. Without the definite knowledge of such a relation, our inference of fire is impossible in spite of the perception of smoke.

A Vyapti may be of two types and they are as follows.

1. Samavyapti
2. Asamavyapti

A **Vyapti** between terms of equal extensions is called **samavyapti** or equipollent concomitance, for example 'nameable' and 'knowable'. Whatever is nameable is knowable and again whatever is knowable is namable. Here, we can infer either of the term from the other.

The **Naiyayikas** maintain that there are five ways or methods for the establishment of **vyapti**. They are the following:

1. **Anvaya** or agreement in presence: **Vyapti** is a relation of agreement in presence (**anvaya**) between two things.
2. **Vyatireka** or agreement in absence: the **hetu** and the **sadhya** should agree in being absent together.
3. **Vyabhicaragraha**: we do not observe any contrary instance in which one of them is present and the other is absent. That is they must be related to each other.
4. **Uadhinirsara** or elimination of condition: **Vyapti** is an unconditional relationship which is universal and necessary. An adventitious condition may vitiate the natural and invariable relation between hetu and sadhya.
5. **Tarka** or hypothetical reasoning: tarka is an indirect method to get the vyapti. All the methods mentioned above are direct methods. Ratiocination is the process of thinking about something in a logical way for the to establish the vyapti.
6. **Samanyalajaa pratyaka**: samanyalaka pratyaka is an extraordinary perception. They maintain that when we perceive an individual case, we also perceive all the actual and possible instances of fire and smoke.

HETVABHAS (FALLACIES OF INFERENCE)

In Indian logic of fallacy is called **hetvabhasa**. It means that middle term appears to be a reason but is not a valid reason. All fallacies are material fallacies. We have mentioned the five characteristics of a valid middle term. When these are violated, we have fallacies. There are five kinds of fallacies that have been given below:

1. **Assiddha or sadhyasama**: this is the fallacy of unproven middle.
2. **Savyabhicara**: this is the fallacy of irregular middle.
3. **Satpratipaksa**: here, the middle term is contradicted by another middle term.
4. **Badhita**: it is the non-inferentially contradicted middle.
5. **Viruddha**: it is the contradictory middle.

Though there is a variance between the six orthodox schools regarding the sources of knowledge, it is a well-accepted fact that all schools have acknowledged **Pratyaksa**, **Anumana** and **Shabda** as valid sources of knowledge. The knowledge through sense experience is considered to be the basic source even in other **pramnas** for further evidences and validation.

EXPECTED MCQS

1. The ultimate objective of Nyaya system is

- To bring an end to human suffering, which results from ignorance of reality.
- To make a person happy with all material wealth
- To make a person happy in all possible manners
- All of the above

Answer: A

2. Which of the following gurus wrote Vassheshika sutras?

- | | |
|------------|-----------------|
| a. Kanada | c. mahatma budh |
| b. Gautama | d. vatsayana |

Answer: a

3. Inference is considered to be a mere leap into the dark'. Which of the following schools considers the above statement?

- Nyaya school
- Mimamsa school
- Charvaka school
- None of the above

Answer: c

4. With which of the following the Vedanta schools had an special affiliation?

- The authority of shruti-that which is heard.
- The Mimamsa- the question after interpreting the sacred texts.
- Both a & b
- None of the above.

Answer: c

5. Mahatma Buddha teaches his Four Noble Truths. Which of the following statements does not apply?

- Dukkha- dissatisfaction with existence in the phenomenal world.
- The origination of dukkha in craving or desire
- The cessation of dukkha
- The way leading to that cessation by following Four fold path

Answer: d

6. Which of the following are considered to be the most sophisticated natural theologians?

- Nyaya
- Buddhism
- Jainism
- None of the above

Answer: a

7. Upamana is basically

- Anumana
- Testimony
- Comparison

d. Object of knowledge

Answer: c

8. Match the following three terms of Indian logic with Aristotelian logic.

Indian Logic	Aristotelian Logic
a. Paksa	1. Middle term
b. Sadhya	2. Major term
c. Linga	3. Minor term

Codes:

- a. A-1, B-2, C-3
- b. A-2, B-1, C-3
- c. A-3, B-2, C-1
- d. A-1, B-3, C-2

Answer: c

9. In its metaphysics, Nyaya is allied to the

- a. Patanjali system
- b. Budha system
- c. Vaisheshika system
- d. Jain system

Answer: c

10. The Nyaya theory of causation defines a cause as an unconditional and invariable antecedent of an effect. Match the following sets of causes:

Types of cause	meaning
a. Inherent	1. It helps in the production of a cause
b. Non-inherent cause	2. The substance out of which an effect is produced
c. Efficient cause effect	3. The power that helps the material cause produce the effect

Codes:

- a. A-1, B-2, C-3
- b. A-2, B-1, C-3
- c. A-2, B-3, C-1
- d. A-3, B-1, C-2

Answer: b

11. Nyaya epistemologists speak of cognition. Which of the following are the components of such cognition?

- 1. Jnana
- 2. Buddhi
- 3. Upalabdhi
- 4. Pratyaya

Codes:

- a. 1 & 2
- b. 1, 2 & 3
- c. 1, 3 & 4
- d. All of the above

Answer: d

12. Which of the following statements are true in the context of Vyapti?

- 1. Vyapti is a relation between Hetu and Sadhya
- 2. Vyapti means co-presence, co-absence of Hetu and Sadhya
- 3. Vyapti (the invariable association of middle and major terms) serves as the basis of Nyaya syllogism

Codes:

- a. 1 & 2
- b. 2 & 3
- c. 1 & 3
- d. 1, 2 & 3

Answer: d

13. Which of the following terms is used for the word probandum?

- a. Sadhya
- b. Vyapati
- c. Hetu
- d. Anumana

Answer: a

14. Which of the following statements are true in the context of anumana?

- a. According to Nyaya, it is the indirect source of valid knowledge.
- b. Anumana should have three terms- hetu, sadhya and paka
- c. Anumana has five propositions

Codes:

- a. 1 & 2
- b. 2 & 3
- c. 1 & 3
- d. 1, 2 & 3

Answer: d

15. Which of the following should be considered as the essential characteristic of anumana (inference)

- 1. Fire, is inferred on the hill, where smoke is perceived in it, it is called as Paksa dharmata.
- 2. When universal relation between fire and smoke is known, it is called Vyapti
- 3. Anumiti does arise without the coexistence of Hetu and Sadhya

Codes:

- a. Only 1
- b. Only 2
- c. Both 1 & 2

d. All of the above

Answer: c

16. Which of the following is termed as the statement of reason?

- a. Hetu
- b. Pratijana
- c. Upanaya
- d. Nigamana

Answer: a

17. Which of the following statements does not apply in context of Anumana?

- a. Anumana is knowing something not by means of contact between the sense and the objects of the world.
- b. Anumana is not by observation
- c. Anumana is not through the medium of sign.
- d. Anumana is inference for oneself or inference for others.

Answer: c

18. What is the number of propositions in Nyaya theory of perceptions?

- a. 3
- b. 4
- c. 5
- d. 6

Answer: c

19. The oldest extent Nyaya text is the Nyaya-sutra that is attributed to great guru

- a. Patanjali
- b. Gautama
- c. Vatsyayana
- d. Udayana

Answer: b

20. Tarka is basically

- a. Inference
- b. Conclusion
- c. Hypothetical argument
- d. Grounds of defeat

Answer: c

21. Nyaya syllogism employs a formal five-step argument. Kindly match the items in list-I in list-II.

List-I

List-II

- | | | |
|--|-------------|--|
| a. There is fire on the hill | 1. Pratijna | |
| b. Because there is smoke on the hill | 2. Hetu | |
| c. Wherever there is smoke, there is fire; like a kitchen hearth and unlike a lake | 3. Upanaya | |
| d. This hill is likewise smoky | 4. Nigamana | |
| e. Thus, there is fire on the hill | | |

Codes:

- a. A-1, B-2, C-3, D-5, E-4
- b. A-2, B-1, C-3, D-4, E-5
- c. A-1, B-2, C-3, D-4, E-5
- d. A-1, B-3, C-2, D-4, E-5

Answer: c

22. Perception of a universal thought an individual which instantiates, it is Nyaya's response to the problem of

- a. Induction
- b. Deduction
- c. Both induction and deduction
- d. None of the above

Answer: a

23. A reason appears to be real or appropriate but in fact is not. With which of the following terms, the fallacy is known as hetvabhasa?

- a. Minor-term
- b. Middle-term
- c. Major-term
- d. All of the above terms

Answer: b

24. To test an argument for fallacies is to focus on the concept of

- a. Ethos
- b. Logos
- c. Pathos
- d. All of the above

Answer: a

ASSERTION & REASON

Directions (Questions 25 to 34): Assertion and reasoning type of questions have one assertion and one reason. The question is followed by four options.

- a. A is true but R is false
- b. A is false but R is true
- c. Both A & R are true and R is not the correct explanation of A.
- d. Both A and R are true and R is the correct explanation of A.

25. Assertion (A): Hindi should be the official language of India.
Reason (R): Majority of people living in India are Hindus.

Answer: c

Hindi should be the official language, but not on the basis of religion. There are many Hindu-dominated areas where Hindi is not being spoken, though Hindi is being spoken by almost half of our population.

26. Assertion (A): In India, people elect their own representatives for Parliament and State Assemblies.

Reason (R): India is a democratic country.

Answer: d

Only in democratic setup, people elect their own representatives.

27. Assertion (A): in India, cotton crop is grown mainly in alluvial soils.

Reason (R): alluvial soils are very fertile.

Answer: b

In India, cotton is mainly raised in the black soil that is found in Maharashtra. Alluvial soil is very fertile in Northern plains.

28. Assertion (A): The Indian constitution came into force with effect from 26 January 1950.

Reason (R): 26 January is celebrated as Republic day.

Answer: d

Republic day celebrated the coming into force of its constitution.

29. Assertion (A): Robert Clive defeated Siraj-ud-daulah in the Battle of Plassey.

Reason (R): The army of Clive was the best and it followed the best strategic policy.

Answer: a

The army of clive won the battle of Plassey; he bribed Mir Jafar, Siraj-ud-daulah's army chief.

30. Assertion (A): The Hoysala sculptures have highly detailed descriptions and ornamentation.

Reason (R): Hoysala sculptures are soft; these have been created in Chloristic Schism.

Answer: a

31. Assertion (A): Akbar abolished jizya in 1564 but reimposed it subsequently.

Reason (R): As a young man he was quite liberal and tolerant but became orthodox and reactionary as he matured.

Answer: c

32. Assertion (A): Gupta period is described as the Golden Age of Indian History.

Reason (R): Guptas issued a large number of gold coins.

Answer: c

33. Assertion (A): most of the Himalayan Rivers are perennial.

Reason (R): they are fed by melting snow.

Answer: d

34. Assertion (A): Earthworms are not good for agriculture.

Reason (R): Earthworms break down the soil into fine particles and make it soft.

Answer: b

UNIT-7

DATA ANALYSIS & INTERPRETATION

Data Interpretation:-

Data interpretation is one of the easiest sections of UGC/CBSE Paper I. It is basically about drawing conclusions and inferences from a comprehensive data presented numerically in a tabular or graphical form by means of an illustration, namely, graphs, pie charts, and so on. Thus, the act of organizing and interpreting data to get meaningful information is data interpretation. The important aspects of data sources their acquisitions and interpretation have been covered in Unit II on Research Aptitude. In this unit, the focus is on solving practical problems as per questions asked in the NTA/CBSE Net pattern.

Tables:-

A table is a systematic arrangement of data into vertical columns and horizontal rows. The process of arranging data into rows and columns is called tabulations.

Purpose:-

The purpose of tabulation is to present the data in such a way that it becomes more meaningful and can be easily understood by a common man. However, in case of voluminous data, it may require closer reading than graphs of charts and hence is difficult and time consuming to interpret.

Essential Parts of a Table:-

A Statistical table is divided into eight, parts, which are explained below;

1- Title of the table:- A title is a heading at the top of the table describing its contents. It mainly reflects upon the nature of the data, where the data is what time period the data covers, and how the data is classified.

2- Caption:- The headings for various columns and rows are called column captions and row captions.

3- Box head:- The portion of the table containing column caption is called box head.

4- Stub:- The portion of the table containing row caption is called stub.

5- Body of the table:- The body of the table contains the statistical data which has to be presented in different rows and columns.

6- Prefatory notes or head notes:- Prefatory notes appear between the title and the body of the table and are enclosed in brackets. They are used to throw some light about the units of measurements, in lakhs, in thousands, and so on.

7- Footnote:- A footnote is always given at the bottom of the table but above the source note. A footnote is a statement about something which is not clear from heading, title stubs, captions and so on.

8- Source note:- A source note is placed immediately below the table but after the footnote. It refers to the source from where information has been taken.

QUANTITATIVE DATA:

Quantitative data is defined as the value of data in the form of counts or numbers where each data-set has an unique numerical value associated with it. This data is any quantifiable information that can be used for mathematical calculations and statistical analysis, such that real-life decisions can be made based on these mathematical derivations.

The most common types of quantitative data are as below:

Counter: Count equated with entities. **For example,** the number of people who download a particular application from the App Store.

Measurement of physical objects: Calculating measurement of any physical thing. **For example,** the HR executive carefully measures the size of each cubicle assigned to the newly joined employees.

Quantification of qualitative entities: Identify numbers to qualitative information. **For example,** asking respondents of an online survey to share the likelihood of recommendation on a scale of 0-10.

Quantitative Data: Collection Methods

As **quantitative data** is in the form of numbers, mathematical and statistical analysis of these numbers can lead to establishing some conclusive results.

There are two main Quantitative Data Collection Methods:

Surveys: A Survey is defined as a research method used for collecting data from a pre-defined group of respondents to gain information and insights on various topics of interest

Face-to-Face Interviews: An interviewer can prepare a list of important interview questions in addition to the already asked survey questions. This way, interviewees provide exhaustive details about the topic under discussion.

Online/Telephonic Interviews: Telephone-based interviews are no more a novelty but these quantitative interviews have also moved to online mediums such as Skype or Zoom. **Computer Assisted Personal Interview:** This is a one-on-one interview technique where the interviewer enters all the collected data directly into a laptop or any other similar device. The processing time is reduced and also the interviewers don't have to carry physical questionnaires and merely enter the answers in the laptop.

Analysis Methods

Data collection forms a major part of the research process. This data however has to be analyzed to make sense of. There are multiple methods of analyzing quantitative data collected in surveys. They are:

Cross-tabulation: Cross-tabulation is the most widely used quantitative data analysis methods. It is a preferred method since it uses a basic tabular form to draw inferences between different data-sets in the research study. It contains data that is mutually exclusive or have some connection with each other.

Trend analysis: Trend analysis is a statistical analysis method that provides the ability to look at quantitative data that has been collected over a long period of time. This data analysis method helps collect feedback about data changes over time and if aims to understand the change in variables considering one variable remains unchanged.

Conjoint analysis: Like in the above method, conjoint analysis is a similar quantitative data analysis method that analyzes parameters behind a purchasing decision. This method possesses the ability to

collect and analyze advanced metrics which provide an in-depth insight into purchasing decisions as well as the parameters that rank the most important.

TURF analysis: TURF analysis or **Total Unduplicated Reach and Frequency Analysis**, is a quantitative data analysis methodology that assesses the total market reach of a product or service or a mix of both. This method is used by organizations to understand the frequency and the avenues at which their messaging reaches customers and prospective customers which helps them tweak their go-to-market strategies.

Qualitative data

Qualitative data can be **observed and recorded**. This data type is non-numerical in nature. This type of data is collected through methods of observations, one-to-one interview, conducting focus groups and similar methods. Qualitative data in statistics is also known as categorical data. Data that can be arranged categorically based on the attributes and properties of a thing or a phenomenon.

QUALITATIVE DATA COLLECTION METHODS:

1. One-to-One Interviews: One of the most commonly used **data collection** instrument for qualitative research, mainly because of its personal approach. The interviewer or the researcher collects data directly from the interviewee on a one-to-one basis. The interview may be **informal and unstructured** – conversational.

2. Focus groups: This is done in a group discussion setting. The group is limited to 6-10 people and a moderator is assigned to moderate the ongoing discussion. Depending on the data which is sorted, the members of a group may have something in common.

3. Record keeping: This method makes use of the already existing reliable documents and similar sources of information as the data source. This **data** can be used in a new research. This is similar to going to a library.

4. Process of observation: In this qualitative data collection method, the researcher immerses himself/ herself in the setting where his respondents are, and keeps a keen eye on the participants and takes down notes. This is known as the process of observation.

5. Longitudinal studies: This data collection method is performed on the same data source repeatedly over an extended period of time. It is an observational research method that goes on for a few years and in some cases can go on for even decades. The goal of this data collection method is to find correlations through an empirical study of subjects with common traits.

6. Case studies: In this method, data is gathered by in-depth analysis of case studies. The versatility of this method is demonstrated in how this method can be used to analyze both simple and complex subjects. The strength of this method is how judiciously it uses a combination of one or more qualitative data collection methods to draw inferences.

BAR CHART OR BAR GRAPH

A **bar chart or bar graph** is a chart or graph that presents categorical data with rectangular bars with heights or lengths proportional to the values that they represent. The bars can be plotted vertically or horizontally. A vertical bar chart is sometimes called a line graph.

A **bar graph** shows comparisons among discrete categories. One axis of the chart shows the specific categories being compared, and the other axis represents a measured value. Some bar graphs present bars clustered in groups of more than one, showing the values of more than one measured variable.

HISTOGRAM

A histogram is a display of statistical information that uses rectangles to show the frequency of data items in successive numerical intervals of equal size. In the most common form of histogram, the independent variable is plotted along the horizontal axis and the dependent variable is plotted along the vertical axis. The data appears as colored or shaded rectangles of variable area.

PIE CHART

A **pie chart (or a circle chart)** is a circular statistical graphic, which is divided into slices to illustrate numerical proportion. In a **pie chart**, the **arc length** of each slice (and consequently its central angle and area), is proportional to the quantity it represents. While it is named for its resemblance to a pie which has been sliced, there are variations on the way it can be presented. The earliest known pie chart is generally credited to **William Playfair's Statistical Breviary of 1801**.

Pie charts are very widely used in the business world and the mass media. **Pie charts** can be replaced in most cases by other plots such as the bar chart, box plot or dot plots.

LINE CHART OR LINE GRAPH

A line chart or line graph is a type of chart which displays information as a series of data points called 'markers' connected by straight line segments. It is a basic type of chart common in many fields. It is similar to a scatter plot except that the measurement points are ordered (typically by their x-axis value) and joined with straight line segments. A line chart is often used to visualize a trend in data over intervals of time – a time series – thus the line is often drawn chronologically. In these cases they are known as **run charts**.

Circle Graphs (or Pie Charts):-

Circle graphs are used to show how various sectors are in the whole. Circle graphs are sometimes called pie charts, circle graphs usually give the percent that each sector receives. In such representation the total quantity in question is distributed over a total angle of 360°. While using pie chart to find the ratios of various sectors, there is no need to find the amounts each sector received and then the ratio of the amount. Find the ratio of the percents, which is much easier.

Simple Bar Graphs:-

Bar charts are one of the easiest, graphically attractive, and hence most commonly used methods of presenting all types of data. Given quantities can be compared by the height or length of a bar graph. A bar graphs can either have vertical or horizontal bars. The width of the bars is largely inessential and is used only for clarity of presentation. We can compare different quantities or the same quantity at different times.

DATA MAPPING

In computing and **data management**, data mapping is the process of creating data element mappings between two distinct data models. Data mapping is used as a first step for a wide variety of data integration tasks, including:

- ❖ Data transformation or data mediation between a data source and a destination
- ❖ Identification of data relationships as part of data lineage analysis
- ❖ Discovery of hidden sensitive data such as the last four digits of a social security number hidden in another user id as part of a data masking or de-identification project
- ❖ Consolidation of multiple databases into a single database and identifying redundant columns of data for consolidation or elimination

Key Aspects of Data Mapping

Given below are the key aspects of Data Mapping –

- ❖ To check the fields in the UI/Front end forms and mapped consistently with the corresponding DB table. This mapping information is defined in the requirements documents as mentioned above.
- ❖ For any action performed in the front end of an application, a corresponding CRUD 'Create, Retrieve, Update and delete' action gets initiated at the back end.
- ❖ A tester will have to check if the right action is invoked and the invoked action in itself is successful or not.

Steps in Data Mapping Testing

Given below are the steps followed for Data Mapping Testing –

- ❖ Step 1 – First check for syntax error in each script.
- ❖ Step 2 – Next is to check for table mapping, column mapping, and data type mapping.
- ❖ Step 3 – Verify lookup data mapping.
- ❖ Step 4 – Run each script when records do not exist in destination tables.
- ❖ Step 5 – Run each script when the records already exist in the destination tables.

Load Testing

The primary target of Load Testing is to check if most running transactions have performance impact on the database. In load testing, you need to check the following aspects –

- ❖ The response time for executing the transactions for multiple remote users should be checked.
- ❖ With normal transactions, you should include one editable transaction to check the performance of the database for these type of transactions.
- ❖ With normal transactions, you should include one non-editing transaction to check performance of database for these type of transactions.
- ❖ Time taken by database to fetch specific records should be checked.

Stress Testing

Stress testing is performed to identify the system breakpoint. Here the application is loaded in such a way that the system fails at one point. This point is called the breakpoint of the database system. Stress testing is also known as **Fatigue Testing**.

Determining the state of database transactions involves a significant amount of effort. Proper planning is required to avoid any time- and cost-based issues.

The most common stress testing tools are **LoadRunner and WinRunner**.

Data:

Data is based on facts and statistics collected together for reference or analysis. Data in numerical format helps us to draw conclusions by comparing the data.

Interpretation:

Interpretation is the act of explaining, re-framing or otherwise showing your own understanding of something.

Data Interpretation:

Data interpretation is an act of analyzing data with the objective to gain useful information from it. It is done to draw conclusions from the given data. Different statistical tools are used to represent the data in organized structures.

Different method in which data can be presented to solve Data Interpretation Questions:

Tables:

Tables are the most convenient and versatile method to present data. Analyzing and drawing conclusions from tables is much easier than any other method. Tables are the fundamental method to represent data. In tables, the data is arranged in rows and columns which help us to scrutinize data efficiently.

Pie chart:

A Pie chart is a pictorial representation of data as part of a circle. The circle presents the total value and the different parts of the circle present certain portions of the data.

There are two types of pie chart: Normal and Exploded

Bar graph:

A bar graph is a way of representing data on the graph using X-axis and Y-axis. It is the most convenient way to present data. It is proven that using lengths in case of bar chart is a better indicator than pie charts where the data is categorized in terms of areas.

Data governance

Data governance is a data management concept concerning the capability that enables an organization to ensure that high data quality exists throughout the complete lifecycle of the data. The key focus areas of data governance include availability, usability, consistency, data integrity and data security and includes establishing processes to ensure effective data management throughout the enterprise such as accountability for the adverse effects of poor data quality and ensuring that the data which an enterprise has can be used by the entire organization.

A data steward is a role that ensures that data governance processes are followed, guidelines enforced, and recommends improvements to data governance processes.

Examples:

During the year

State Year	A		B		C		D		E		F	
	Pre-sented	Passed	Pre-sented	Passed	Pre-sented	Passed	Pre-sented	Passed	Pre-sented	Passed	Pre-sented	Passed
1994	1200	105	1400	125	1650	140	1450	160	1700	185	1800	165
1995	1450	110	1250	130	1500	125	1600	145	1850	170	1650	170
1996	1100	120	1300	115	1400	150	1250	120	1400	160	1550	140
1997	1350	125	1100	120	1550	145	1300	140	1550	155	1700	155
1998	1400	135	1550	105	1750	155	1400	155	1650	175	1750	160
1999	1500	140	1450	110	1700	130	1500	165	1500	165	1600	175

Q.1 what is the approximate percentage of the passed candidates jointly from all the six states to the presented candidates in the year 1994?

(a) 15 (b) 10 (c) 7 (d) 12 (e) 14

Q.2 which one of the following states has maximum percentage of the passed candidates to the presented candidates in 1996?

(a) B (b) D (c) C (d) E (e) None of these

Q.3 What is the percentage of passed candidates jointly from the state 'C' in the year 1995 and 1998 to the presented candidates jointly from the state 'B' in the year 1994 and 1997?

(a) 12.5 (b) 10.8 (c) 10.2 (d) 12.4 (e) None of these

Q.4 What is the approximate average number of passed candidates from state 'D' in the given years?

(a) 148 (b) 158 (c) 142 (d) 154 (e) 140

Q.5 Which one of the following years has least percentage of passed candidates to the presented candidates from the state 'F'?

(a) 1998 (b) 1997 (c) 1996 (d) 1994 (e) None of these

Solution

1. Total number of all presented candidates of all six states in the year 1994

$$= 1200 + 1400 + 1650 + 1450 + 1700 + 1800$$

$$= 9200$$

Total number of passed candidates of all six states in the year 1994

$$= 105 + 125 + 140 + 160 + 185 + 165$$

$$= 880$$

$$\therefore \text{Requires percentage} = \frac{880 \times 100}{9200} = 10\% \text{ (Approx.)}$$

Therefore, the answer is (B).

2. The percentage of passed candidates to presented candidates of state A in 1996

$$\frac{120 \times 100}{1100} = 10.91$$

The percentage of passed candidates to presented candidates of state 'B' in 1996

$$\frac{115 \times 100}{1300} = 8.85$$

The percentage of passed candidates to presented candidates of state 'C' in 1996

$$\frac{150 \times 100}{1400} = 10.71$$

The percentage of passed candidates to presented candidates of state 'D' in 1996

$$\frac{120 \times 100}{1250} = 9.6$$

The percentage of passed candidates to presented candidates of state 'E' in 1996

$$\frac{160 \times 100}{1400} = 11.43$$

The percentage of passed candidates to presented candidates of state 'F' in 1996

$$\frac{140 \times 100}{1550} = 9.03$$

∴ The percentage of state 'E' is the highest. Hence, the answer is (D).

3. The number of passed candidates of state (C) jointly in the year 1995 and 1998

$$= 125 + 155 = 280$$

The number of presented candidates of state 'B' jointly in the year 1994 and 1998

$$= 1400 + 1100 = 2500$$

$$\therefore \text{Requires percentage} = \frac{280 \times 100}{2500} = 111.2$$

Hence, the correct answer is (E).

4. Required average number

$$= \frac{160+145+120+140+155+165}{6} = 148 \text{ (Approx.)}$$

Therefore, the correct answer will be (A).

5. The percentage of passed candidates to the presented candidates from state 'F' in 1994

$$\frac{165 \times 100}{1800} = 9.17$$

The percentage of passed candidates to the presented candidates of state 'F' in the 1995

$$\frac{170 \times 100}{1650} = 10.30$$

The percentage of passed candidates to the presented candidates of state 'F' in 1996

$$\frac{140 \times 100}{1550} = 9.03$$

The percentage of passed candidates to the presented candidates of state 'F' in 1997

$$\frac{155 \times 100}{1700} = 9.11$$

The percentage of passed candidates to the presented candidates of state 'F' in 1998

$$\frac{160 \times 100}{1750} = 9.14$$

And the percentage of passed candidates to the presented candidates of state 'F' in 1999

$$\frac{175 \times 100}{1600} = 10.94$$

∴ The least percentage is in 1996.

∴ The correct answer will be (C).

The table below embodies data on the sales revenue (rs in lakh) generated by a publishing house during the years 2012-15 while selling books, magazines and journals as three categories of items. Answer questions 31-33 based in the data contained in the table.

Sales Revenue(₹ in Lakh)

Year	2012	2013	2014	2015
Items				
Journals	46	47	45	44
Magazines	31	39	46	51
Books	73	77	78	78
Total				

Q.NO: 1 If the year 2016 were to show the same growth in terms of total sales revenue as the year 2015 over the year 2014, then the revenue in the year 2016 must be approximately:

- (1). 194 lakh
- (2). 187 lakh
- (3). 172 lakh
- (4). 177 lakh

Answer: 4

Q.NO: 2 In 2015, approximately what percent of total revenue come from books?

- (1). 45%
- (2). 55%
- (3). 35%
- (4). 25%

Answer: 1

Q.NO: 3 The number of years in which there was an increase in revenue from at least two categories of items, is

- (1). 0
- (2). 1
- (3). 2
- (4). 3

Answer: 3

A University professor maintains data on MCA students tabulated by performance and gender of the students. The data is kept on a computer hard disk, but accidentally some of it lost because of a computer virus. Only the following could be recovered:

Number of MCA Students				
Performance	Average	Good	Excellent	Total
Gender				
Male			10	
Female				32
Total		30		

Panic buttons were pressed but to no avail. An expert committee was formed, which decided that the following facts were self-evident:

- (a) Half the students were either excellent or good.
- (b) 40% of the students were females
- (c) One-third of the male students were average

Answer questions 4-6 based on the data given above

Q.NO: 4 approximately, what proportion of good students are male?

- (1). 0
- (2). 0.73

- (3). 0.43
(4). 0.27

Answer: 2

Q.NO: 5 How many female students are excellent?

- (1). 0
(2). 8
(3). 16
(4). 32

Answer: 1

Q.NO: 6 What proportion of female students are good?

- (1). 0
(2). 0.25
(3). 0.50
(4). 0.75

Answer: 2

Consider the following two tables (I and II) that show the percentage of students in each faculty at University and the number of foreign students in the Science faculty. These percentages have been rounded to the nearest whole number. There are a total of 1049 students in the science faculty. Study these tables I and II and answer the questions that follow:

I : Students Facultywise

Name of Faculty	% of Students
Computing	22
Business	14
Science	23
Engineering	9
Arts	21
Medicine	5
Law	6

II : Foreign Students in Science Faculty

Foreign Students	Number of Science Students
American	79
Australian	4
African	2
Chinese	6
European	21

1. Approximately, what percentage of students in the Science faculty is that of foreign students?

- (A) 14%
(B) 9%
(C) 30%
(D) 11%

Answer - (D)

2. Approximately, how many students belong to the Engineering faculty?

- (A) 420
(B) 410
(C) 390
(D) 400

Answer - (B)

3. In case, there are 34 European medical students, then approximately, what is their percentage in the medicine faculty?

- (A) 13%
(B) 18%
(C) 12%
(D) 15%

Answer - (D)

A college has a total of 800 MCA students, 80% of whom are in class MCA-III and remaining are equally divided between class MCA-I and class MCA-II. The proportion of female students and the proportion of vegetarian students in the college are indicated as under through the table. Answer questions 4 to 6 based on this information.

Proportion of females and proportion of vegetarians in each class

Class	Female (F)	Vegetarian (V)
MCA-I	0.40	
MCA-II	0.45	0.50
MCA-III		0.55
Total	0.525	0.53

For example, in the table above, 0.525 is the total proportion of female students and 0.53 is the total proportion of vegetarian students in the college.

4. What is the percentage of female students in class MCA-III ?

- (A) 40
(B) 45
(C) 50
(D) 55

Answer - (D)

5. What is the percentage of vegetarian students in class MCA-I?

- (A) 40
(B) 45
(C) 50
(D) 55

Answer - (A)

Total Students = 800.

No. of students in MCA III = 80% of 800 = 640.

Rest Students = 800 - 640 = 160.

Rest students are divided equally into class MCA I & MCA II. So,

No. of students in class 12 = $160/2 = 80$.

Now, total vegetarian = 53%

No. of Total vegetarian = 53% of 800 = 424.

55% of MCA III students are vegetarian.

No. of vegetarian in MCA III = 55% of 640 = 352.

No. vegetarian in MCA II = 50% of 80 = 40

Thus, no. of vegetarian in MCA I,

= $424 - 352 - 40 = 32$.

Thus,

In class MCA I total vegetarian = 32.

So, % of vegetarian = $(32/800) * 100 = 40\%$.

6. How many total non-vegetarian students are there in class MCA-I and class MCA-II?

- (A) 72
(B) 88
(C) 78
(D) 92

Answer - (B)

The following table shows the percentage profit (%) earned by two companies A and B during the years 2011-15. Answer questions 1 to 3 based on the data contained in the table:

Year	Percentage Profit (%)	
	A	B

2011	20	30
2012	35	40
2013	45	35
2014	40	50
2015	25	<u>35</u>

Where, percent (%) Profit = $(\text{Income} - \text{Expenditure}) \times 100 / \text{Expenditure}$

1. If the total expenditure of the two companies was Rs.9 lakh in the year 2012 and the expenditure of A and B were in the ratio 2:1, then what was the income of the company A in that year?

- (A) Rs.9.2 lakh
- (B) Rs.8.1 lakh
- (C) Rs.7.2 lakh
- (D) Rs.6.0 lakh

Answer B

2. What is the average percentage profit earned by the company B?

- (A) 35%
- (B) 42%
- (C) 38%
- (D) 40%

Answer C

3. In which year, the percentage profit earned by the company B is less than that of company A?

- (A) 2012
- (B) 2013
- (C) 2014
- (D) 2015

Answer B

Given below in the table is the decadal data of Population and Electrical Power Production of a country.

Year	Population (million)	Electrical Power Production (GW)*

1951	20	10
1961	21	20
1971	24	25
1981	27	40
1991	30	50
2001	32	80
2011	35	100
		* 1 GW = 1000 million watt

Based on the above table, answer the following questions:

1. Which decade registered the maximum growth rate (%) of population?

- (A) 1961-71
- (B) 1971-81
- (B) 1991-2001
- (D) 2001-2011

Answer A

2. Average decadal growth rate (%) of population is:

- (A) ~12.21%
- (B) ~9.82%
- (C) ~6.73%
- (D) ~5%

Answer B

3. Based on the average decadal growth rate, what will be the population in the year 2021?

- (A) 40.34 million
- (B) 38.49 million
- (C) 37.28 million
- (D) 36.62 million

Answer B

4. In the year 1951, what was the power availability per person?

- (A) 100 W
- (B) 200 W

(C) 400 W

(D) 500 W

Answer D

5. In which decade, the average power availability per person was maximum?

(A) 1981-1991

(B) 1991-2001

(C) 2001-2011

(D) 1971-1981

Answer C

6. By what percentage (%) the power production increased from 1951 to 2011?

(A) 100%

(B) 300%

(C) 600%

(D) 900%

Answer D

Read the following table and answer question based on table:

Year	Government Canals	Private Canals	Tanks	Tube wells and other wells	Other sources	Total
1997-98	17117	211	2593	32090	3102	55173
1998-99	17093	212	2792	33988	3326	57411
1999-00	16842	194	2535	34623	2915	57109
2000-01	15748	203	2449	33796	2880	55076
2001-02	15031	209	2179	34906	4347	56672
2002-03	13863	206	1802	34250	3657	53778
2003-04	14444	206	1908	35779	4281	56618
2004-05	14696	206	1727	34785	7453	58867
2005-06	15268	207	2034	35372	7314	60196

1. Which of the following sources of Irrigation has registered the largest percentage of decline in Net area under irrigation during 1997-98 and 2005-06 ?

(A) Government Canals

(B) Private Canals

(C) Tanks

(D) Other Sources

Answer C

2. Find out the source of irrigation that has registered the maximum improvement in terms of percentage of Net irrigated area during 2002-03 and 2003-04.

- (A) Government Canals
- (B) Tanks
- (C) Tube Wells and other wells
- (D) Other Sources

Answer D

3. In which of the following years, Net irrigation by tanks increased at the highest rate?

- (A) 1998-99
- (B) 2000-01
- (C) 2003-04
- (D) 2005-06

Answer D

4. Identify the source of irrigation that has recorded the maximum incidence of negative growth in terms of Net irrigated area during the years given in the table.

- (A) Government Canals
- (B) Private Canals
- (C) Tube Wells and other wells
- (D) Other sources

Answer A

5. In which of the following years, share of the tube wells and other wells in the total net irrigated area was the highest?

- (A) 1998-99
- (B) 2000-01
- (C) 2002-03
- (D) 2004-05

Answer C

Following table provides details about the Foreign Tourist Arrivals (FTAs) in India from different regions of the world in different years. Study the table carefully and answer the questions based on this table.

Region	Number of Foreign Tourist Arrival
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	2007	2008	2009
Western Europe	1686083	1799525	1610086
North America	1007276	1027297	1024469
South Asia	982428	1051846	982633
South East Asia	303475	332925	348495
East Asia	352037	355230	318292
West Asia	171661	215542	201110
Total FTAs in India	5081504	5282603	5108579

1. Find out the region that contributed around 20 percent of the total foreign tourist arrivals in India in 2009.

- (A) Western Europe
- (B) North America
- (C) South Asia
- (D) South East Asia

Answer B

2. Which of the following regions has recorded the highest negative growth rate of foreign tourist arrivals in India in 2009?

- (A) Western Europe
- (B) North America
- (C) South Asia
- (D) West Asia

Answer D

3. Find out the region that has been showing declining trend in terms of share of foreign tourist arrivals in India in 2008 and 2009.

- (A) Western Europe
- (B) South East Asia
- (C) East Asia
- (D) West Asia

Answer D

4. Identify the region that has shown hyper growth rate of foreign tourist arrivals than the growth rate of the total FTAs in India in 2008.

- (A) Western Europe
- (B) North America

(C) South Asia

(D) East Asia

Answer C

In the following table, trends in production of energy in India by primary sources are given. Study the table and answer the following questions: (Production in peta Joules)

Year	Coal & Lignite	Crude Petroleum	Natural Gas	Electricity (Hydro & Nuclear)	Total
2006-07	7459	1423	1223	4763	14,868
2007-08	7926	1429	1248	4944	15,547
2008-09	8476	1403	1265	5133	16,277
2009-10	9137	1411	1830	4511	16,889
2010-11	9207	1579	2012	5059	17,857

1. In which year primary sources recorded the lowest growth in total production of energy?

(A) 2007–08

(B) 2008–09

(C) 2009–10

(D) 2010–11

Answer C

2. Which source of energy has shown the highest growth rate in production during 2006-07 to 2010-11?

(A) Coal & lignite

(B) Crude petroleum

(C) Hydro & nuclear electricity

(D) Total production of energy

Answer A

3. Which one of the following primary sources of energy has recorded the highest growth in production in 2008–09?

(A) Coal & lignite

(B) Crude petroleum

- (C) Natural gas
(D) Hydro & nuclear electricity

Answer A

4. In which year, production of hydro and nuclear electricity was almost double the production of crude petroleum and natural gas taken together?

- (A) 2006–07
(B) 2007–08
(C) 2008–09
(D) 2009–10

Answer C

Read the table below and based on this table answer the following questions:

Area under Major Horticulture Crops (in lakh hectares)

Year	Fruits	Vegetables	Flowers	Total Horticulture Area
2005-06	53	72	1	187
2006-07	56	75	1	194
2007-08	58	78	2	202
2008-09	61	79	2	207
2009-10	63	79	2	209

1. Which of the following two years have recorded the highest rate of increase in area under the total horticulture?

- (A) 2005-06 & 2006-07
(B) 2006-07 & 2008-09
(C) 2007-08 & 2008-09
(D) 2006-07 & 2007-08

Answer D

2. Shares of the area under flowers, vegetables and fruits in the area under total horticulture are respectively:

- (A) 1, 38 and 30 percent
(B) 30, 38 and 1 percent
(C) 38, 30 and 1 percent
(D) 35, 36 and 2 percent

Answer A

3. Which of the following has recorded the highest rate of increase in area during 2005-06 to 2009-10?

- (A) Fruits
- (B) Vegetables
- (C) Flowers
- (D) Total horticulture

Answer C

4. Find out the horticultural crops that have recorded an increase of area by around 10 percent from 2005-06 to 2009-10.

- (A) Fruits
- (B) Vegetables
- (C) Flower
- (D) Total horticulture

Answer B

5. What has been the share of area under fruits, vegetables and flowers in the area under total horticulture in 2007-08?

- (A) 53 percent
- (B) 68 percent
- (C) 79 percent
- (D) 100 percent

Answer B

6. In which year, area under fruits has recorded the highest rate of increase?

- (A) 2006-07
- (B) 2007-08
- (C) 2008-09
- (D) 2009-10

Answer A

The following table presents the production of electronic items (TVs and LCDs) in a factory during the period from 2006 to 2010. Study the table carefully and answer the following questions.

Year	2006	2007	2008	2009	2010
TV	6000	9000	13000	11000	8000

LCDs 7000 9400 9000 10000 12000

1. In which year, the total production of electronic items is maximum?

- (A) 2006
- (B) 2007
- (C) 2008
- (D) 2010

Answer C

2. What is the difference between averages of production of LCDs and TVs from 2006 to 2008?

- (A) 3000
- (B) 2867
- (C) 3015
- (D) 2400

3. What is the year in which production of TVs is half the production of LCDs in the year 2010?

- (A) 2007
- (B) 2006
- (C) 2009
- (D) 2008

Answer B

4. What is the ratio of production of LCDs in the years 2008 and 2010?

- (A) 4 : 3
- (B) 3 : 4
- (C) 1 : 3

Answer B

5. What is the ratio of production of TVs in the years 2006 and 2007?

- (A) 6 : 7
- (B) 7 : 6

(C) 2 : 3

UNIT-8

INFORMATION & COMMUNICATION TECHNOLOGY

Information & Communication Technology: ICTs are basically information-handling tools, such as a varied set of goods, applications and services that are used to produce, store, and process, distribute and exchange information.

ICT includes both old and new tools. Old ICT tools mainly include radio, TV and telephone. New ICT tools mainly include computers, satellite, wireless technology and the internet. These different tools are now able to work together and combine to form our networked world, where we have a massive infrastructure of interconnected telephone services, standardized computing hardware, the internet, radio and TV, which reaches into every nook and corner of the world.

ICT Governance

Information and Communication technology (ICT) is an emerging area as a delivery platform in public services mostly used by government organizations and also by the corporate. ICT projects and applications facilitate redesign of processes and convergence in the organization. In order to have an effective delivery of IT services for transitional and socio-economic change, a governance structure must be developed with specific focus to organizational goals. ICT projects are intended to bring transitional and socio-economic change, but they can be successful only when there is good governance.

The phenomenal increase of technology development, deployment and growth has given rise to a new emerging area known as **information and communication technologies (ICT)**. In many countries including India, governments are exploring the potential of ICT to create new dimensions in economic and social progress. The pervasive use of technology in ICT projects has resulted in a critical dependency on IT shifts with specific focus on IT governance. **Governance refers** to leadership and organizational structures and processes that ensure IT sustains itself while extending the organization's strategy and objectives. Therefore, IT projects in public sector have extensive requirements and goals because here IT plays the role of fulfilling economic and political objectives. Most of the best practices in ICT governance are developed to **improve transparency and accountability** and for reducing cost. Governance in IT also applies to all types of organizations (government, corporate and non-governmental organizations). Governance in ICT is essential for efficiency and to organize resources for the next growth of IT developments, keeping in view the costs and budgets for ICT projects. **The importance and need for governance in ICT is due to the following reasons:**

- ❖ The role of IT is pivotal in achieving business or socio-economic objectives
- ❖ Helps the organization to overcome IT risks
- ❖ Creates awareness of ICT in public services
- ❖ Reduces cost in service delivery
- ❖ Due to these reasons ICT governance is becoming critical in organizations and hence an effective governance approach must first identify answers to three key questions:

In **ICT governance**, decisions are **highly important**. Normally, IT decisions involves the role of management in IT objectives, architecture, business application requirements, infrastructure and investment. These important decision areas support organizations to understand whether their IT is able of deliver expected business needs along with resource management, performance and

alignment. Therefore governance in IT is not just an IT management function instead, it is an ongoing activity with specific focus on enhancing and controlling IT for the **benefit of primary stakeholders, customers and employees. Governance is the ultimate responsibility of the senior management or Board of Directors to ensure IT is adequately owned and used in the organization.**

Developing and implementing ICT governance principles involves addressing a number of process issues practically. **Some of the best practices or critical success factors in ICT governance initiatives are summarized below:**

Enterprise wide IT approach should be adopted. IT along with business units must define all requirements and controls (in-house and external).

- ❖ Accountability and top level commitment. The management responsibilities and accountabilities must be clearly defined in the organization. ICT governance can be successful when there is clear direction and objectives from the executives or Board.
- ❖ A framework for IT controls should be developed and required in the organization. This framework will be developed through consensus, by defining IT processes and controls required for managing the IT function effectively.
- ❖ Costs play a big role ICT governance programs. ICT projects offer opportunities for financial savings when the project is implemented fully and when users are satisfied. Financial savings in the organization provide support and open new potential for more ICT projects.

Strengths and Weaknesses of ICTs:-

1. Individualization of learning:- Individualization of learning means that people learn as individual and not as a homogenous group.

2. Interactivity:- through interactivity feature, the learner can relate to the content more effectively go forward and backward in the content.

3. Distance and climate insensitive:- Teaching and learning could be taken out of the conventional education system of schools and colleges.

4. More economical higher speed of delivery and wider reach

5. Multiple teaching functions and diverse audiences

6. Uniform quality:- if content is well produced and is of good quality the same quality can be delivered to the rich and the poor, the urban and the rural equally at the same low cost.

Weakness:-

1. High infrastructure and startup costs.
2. Little attention towards individual differences in order to achieve economies of scale
3. Accessibility issue
4. ICT is basically a delivery system
5. Difficulty in performance evaluation
6. Continuous training requirement
7. Call for attitudinal change to understanding of teaching and learning.

Synchronous & Asynchronous Media

Media technologies can be grouped into two categories namely synchronous and asynchronous. Synchronous media requires all participants to be together at the same time even though when they

are in different locations. Asynchronous media allows participants in the learning process to be at different times and at different places.

Major ICT Learning Categories

1. **Electronic learning:** it is also known as online learning and is commonly associated with the field of advanced learning technology, which deals with both the technologies and associated methodologies in learning using networked and multimedia technologies. Distance education provided the base for e-learning's development. E-learning can be 'on demand'. It overcomes timing, attendance and travel difficulties. It also allows higher participation and greater interaction.
2. **Blended learning:** it is a combination of multiple approaches to learning. It is usually used to define a situation where different delivery methods are combined together to deliver a particular course. These methods may include a mixture of face-to-face learning, self-paced learning and online classrooms.
3. **Face-to face learning:** it refers to learning that occurs in a traditional classroom setting where a faculty member delivers instructions to a group of learners. This could include lectures, workshops, presentations, tutoring, and conferences and so on.
4. **Self-paced learning:** it provides the flexibility to learn according to the availability of learners' own time and pace. It occurs in a variety of ways, such as reading specific chapters from the text book, studying the course material presented through web-based or CD-based courses, attending pre-recorded classes or sessions, reading articles referred by the faculty members, working on assignments and projects and searching and browsing the internet.
5. **Online collaborative learning:** it involves interaction between the learners and the faculty members through the web. This interaction can occur in one of the following modes, such as through synchronous interaction and asynchronous interaction.
6. **Distance learning:** it is a type of education, where students work on their own at home or at office and communicate with the faculty and other students through e-mail, electronic forums, video conferencing, chat rooms, instant messaging and other forms of computer-based communication. It is also known as open learning. Most distance learning programmes include a computer based training (CBT) system and communications tools to produce a virtual classroom. As the internet and World Wide Web (WWW) are accessible from virtually all computer platforms, they are increasingly serving as the foundation for many distance learning systems.

Digital Initiatives in Higher Education

Digital revolution has brought many changes in the Higher Education. In fact, every institute is taking various initiatives in promoting digital education. Various initiatives have been taken up such as **SWAYAM (India's own MOOCs)**, **Swayam Prabha**, **National Digital Library** and **National Academic Depository**. UGC is in the process of developing online education regulation.

MHRD has also taken measures such as 'cashless campus' and digital financial literacy of community by students. The aim to raise the gross enrolment ratio in the higher education is to be taken to 30 by 2020.

To democratize the opportunities of quality education, the Govt has launched the National Mission on Education through **ICT (NMEICT)** to translate the power of IT into expanded learning opportunities. Over a period of time, **NMEICT** has made significant gains by developing IT interventions that have potential to change the higher education scenario. The various initiatives of higher education in India are:

1. **National Mission on Education through Information & communication Technology (NMEICT):** NMEICT is a centrally sponsored scheme to realize the potential of ICT in teaching learning process for the benefit of all the learners in higher education institutions anytime and

anywhere. Content generation and connectivity along with provision for access devices for institutions and learners and the main objectives. Now many universities have been provided 1 Gbps connectivity and more than 14,000 colleges have also been provided VPN (Virtual Private Network) connectivity. A view software has been developed under the NMEICT for teacher training. This could become the basis for successful implementation of the proposed national mission of teachers. Under the N-list program of INFLIBNET (under NMEICT), lakhs of e-books and thousands of high quality paid e-journals have been made available to colleges and universities with a view to inculcate research culture in teachers and students.

2. National programme on Technology Enhanced Learning (NPTEL): NPTEL was initiated by seven Indian institutes of technology (Bombay, Delhi, Kanpur, Kharagpur, Madras, Guwahati, and Roorkee) along with the Indian institute of science, Bangalore in 2003. Five core disciplines were identified, namely civil engineering, computer science, electrical engineering, electronics and communication engineering and mechanical engineering and 235 courses in web/video format were developed in this phase. The main goal of NPTEL phase II was to build on the engineering and core science courses launched previously in NPTEL phase I. An additional 600 web and video courses were created in all major branches of engineering, physical sciences at the undergraduate and postgraduate levels and management courses at the postgraduate level.

3. SWAYAM: It is an indigenous (Made in India) IT Massive Open Online Courses (MOOCs) Platform for providing best quality education that can be accessed by anyone, anytime and anywhere using the IT system. It was launched by Government of India to achieve the three cardinal principles of Education – access, equity and quality. Access means to take the best teaching learning even to the most disadvantaged. It seeks to bridge the digital divide for the economically disadvantaged students, at all levels. It is taught in classrooms from 9th class till post-graduation to be accessed by anyone, anywhere at any time. The sessions are developed by best faculty and available free of cost. There are more than 1,000 specially chosen faculty members. The courses hosted on SWAYAM are in 4 quadrants:

- a. Video tutorials covering a whole course- normally of 20 hours, each lecture not exceeding 30 minutes.
- b. E-content: added to the learning imparted through the video tutorials.
- c. Self-assessment: quizzes/assignments that intersperse the course

Features of SWAYAM

- ❖ High quality learning experience using multimedia on anytime, anywhere basis.
- ❖ One-stop web location for interactive e-content for all courses from school to university level.
- ❖ State of the art system and discussion forum to clarify doubts.
- ❖ Hybrid model that adds to the quality of classroom teaching.

Thus all this happens through by using audio-video, multi-media and state of the art pedagogy/technology. **Nine National Coordinators have been appointed: they are AICTE for self-paced and international courses, NPTEL for engineering, UGC for non-technical post-graduation education, CEC for under-graduate education, NCERT & NIOS for school education, IGNOU for out of the school students, IIMB for management studies and NITTTR for teacher training programme.**

Students looking for certifications shall be registered and be offered a certificate on successful completion of the course, with a little fee. The assessment takes place through proctored examination takes place through proctored examination and the marks/grades secured in this exam could be transferred to the academic record of the students. UGC has already issued the UGC (Credit Framework for online learning courses through SWAYAM) Regulation 2016 advising the universities to identify courses where credits can be transferred on the academic record of the students.

SWAYAM platform is indigenously developed by MHRD and AICTE with the help of Microsoft and would be ultimately capable of hosting 2000 courses and 80000 hours of learning: covering school, under-graduate, post-graduate, engineering, law and other professional courses.

4. SWAYAM Prabha: The 32 educational DTH channels: The SWAYAM PRABHA has been conceived as the project for telecasting high quality educational programmes through 32 DTH channels on 24x7 basis. Every day, there will be new content of at least 4 hours which would be repeated 6 times in a day, allowing the students to choose the time of his convenience. The DTH channels cover:

- a. Curriculum based courses contents covering diverse disciplines such as arts, science, engineering, technology, law, medicine, agriculture etc
- b. Curricula and courses that can meet the needs of life-long learners or Indian citizens in India and abroad.
- c. IIT-PAL – to assist the students in the classes 11th and 12th aspiring to join IITs- the 4th channels under thus would be on mathematics, physics, chemistry and biology.

The project was conceived and completed within 3 months with the active participation of the Bhaskaracharya Satellite Application Centre and Geoinformatics (BISAG) Ghandinagar and ECIL Hyderabad.

5. National digital library (NDL): A project titled “Development of National Digital Library of India, towards building a national asset” has been sanctioned by IIT kharahpur under NMEICT by MHRD. NDL projects aims to develop:

- a. Overall framework to collect large number of e-content, virtual library, covering needs of learners with different abilities for different levels of education.
- b. Design & development of “OAI-PMH” Server for Metadata Harvesting, Indexed etc.
- c. Pan-India virtual teaching-learning-evaluation knowledge platform and for key national asset and collect resources from other Ministries.

There are more than 72 lakh digital books available through the NDL and available through mobile also.

6. National Academic Depository (NAD): It is an initiative of MHRD to facilitate digital issuance, storage access and verification of Academic Awards issued by Academic Institutions. NAD is a unique, innovative and progressive initiative under “Digital India” theme towards achieving Digital enablement of the Education Records. NAD aspires to make the vision of Digital Academic certificates for every Indian a reality.

7. e-Shodh sindhu: More than 15,000 international electronic journals and e-books are made available to all the higher educational institutions through the e-shodh sindhu initiative. This allows access to be best education resources in the world using digital mode. The INFLIBNET, Gandhnagar-Gujarat is implementing the scheme.

8. Virtual labs: the physical distances and lack of other resources make us unable to perform experiments, especially when they involve sophisticated instruments. Good teachers are always a scarce resource. Web-based and video-based courses address the issue of teaching to some extent. They learn basic and advanced concepts through remote experimentation. Now it is possible to design good experiments around some of these equipment's, which would enhance the learning of a student. Internet-based experimentation further permits use of resources- knowledge, software, and data available on the web, apart from encouraging skillful experiments being simultaneously performed at points separated in space.

9. E-yantra: an MHRD initiative under NMEICT programme name e-yantra is implemented to incorporate Robotics into engineering education with the objective of engaging students. This needs exciting skills of mathematics, computer science and engineering principles. eYantra created creates projects that are based to train teachers. MHRD sees the core skills developed by IITB.

10. Campus connectivity: establishment of 1 GBPS connectivity to universities and 512 Kbps broadband connectivity to colleges has been provisioned under NMEICT.

11. Talk to a teacher: Talk to a teacher developed by IIT Bombay, is an initiative of the National Mission on Education through ICT. It has been funded by MHRD to provide free access to a few selected graduate and postgraduate courses, taught at IIT Bombay by distinguished faculty members and scholars at large. It uses A-View collaboration tool developed by Amrita University for providing virtual classrooms to the faculty across the country. These courses can be viewed absolutely free of charge at lower bandwidths on a personal computer/laptop having a headphone and internet connection.

12. E-Acharya: E-Acharya also called 'integrated e-content portal' of NMEICT, is the official repository of NMEICT e-content and all content produced under NMEICT is being put at this Repository platform at INFLIBNET center Gandhinagar. The basic tenets of preservation for digital content, implement standard metadata schema are provided. Contents are mostly provided by NCERT.

13. E-Kalpa: it is another MHRD/NMEICT initiative named as e-kalpa. It creates digital-learning environment for design in India.

14. The Free & Open Source Software for Education (FOSSEE): FOSSEE project sanctioned to IIT Bombay has been promoting use of open source software in educational institutions. (<http://fossee.in>) It does through instructional material, such as spoken tutorials, documentation such as textbook companions, awareness programmes, such as conferences, training, workshops and internships.

15. E-vidvan: the information and library network (INFLIBNET) centre took the initiative called Vidwan: expert database and national researcher's network with the financial support from NMEICT. The objectives of VIDWAN is to:

a. Collect academic and research profiles of scientists, faculty and research scientists working in leading academic and R&D organizations in India and abroad.

b. Quickly and conveniently provide information about experts to peers, prospective collaborators, funding agencies, policy makers and research scholars in the country.

16. Central cloud infrastructure: The MHRD under NMEICT has awarded a project to IIT Delhi, to set up a robust 24x7 backed data center and the activities have been put up at NIC/NKN Data center and the cloud is called Baadal. The IIT Delhi cloud is hosting e-content and video content of e-acharya.

Other Major Digital Initiatives in Higher Education

1. Lekhika 2007: It was developed by the Centre for the Development of Advanced Computing (C-DAC) under India's IT Ministry and Israel's FTK technologies. The objective of this project is to spread computer literacy to the masses in India who do not English.

2. National Programme on Technology Enhanced Learning (NPTEL): It is a joint initiative of the IITs (Indian Institute of Technology and IISc (Indian Institute of Science) to provide e-Learning through online web and video courses in engineering, science and humanities stream, which is aiming to enhance the quality of engineering education in the country by providing free online courseware.

3. National Knowledge Network (NKN) and Connected Digital: an initiative has been undertaken to cover 1000 institutions besides providing digital campuses, video-conference classrooms, and wireless hotspots to all students of professional courses.

4. Centre for distance engineering education program (CDEEP): CDEEP is an emulated classroom interaction programme by using real-time interactive satellite technology. This was launched by the Institute of Technology – Bombay.

5. EDUSAT: the launch of EDUSAT brought satellite connectivity to large parts of rural India. IGNOU is leveraging satellite, TV and internet technologies to offer online courses.

6. **IIMs:** IIM-C, IIM-B, IIM-K, XLRI and other management institutes have started offering courses after the distance education council allowed them to do so in 2007.
7. **Brihaspati:** this open source e-learning platform has been developed by IIT-Kanpur.
8. **Consortium for educational communication:** it has been tasked with the creation of e-content for 87 undergraduate courses. UGC has cleared a proposal to publish e-content for 77 postgraduate courses.
9. **IIT Madras:** it has been assigned the task to develop e-contents for 996 courses. These courses belong to engineering, science, technology and management.
10. **Shruti-drishti:** it is basically created for visually impaired women empowerment.
11. **GRID GARUDA:** it is India's first national grid bringing together the academic, scientific and research communities for developing their data and other applications. It is connected with National Knowledge Network.
12. **Sakshat portal:** launched in 2006, **sakshat** is a one-stop education portal for addressing all the education and learning related needs of students, scholars, teachers and lifelong learners. It has been developed at IGNOU. The portal was developed by NIC and it provides links to vast knowledge resources, educational news and other useful links are available on the web.
13. **Education & Research Network:** it is promoted by the department of information technology, government of India. It provides communication infrastructure and services to academic research institutions in India.
14. **E-Gyankosh:** it is a knowledge repository launched by **IGNOU in 2005** which aims at storing and preserving digital learning resources.
15. **Gyan vani:** it is a bouquet of frequently modulation (FM) radio channels which broadcast programs contributed by institutions such as IGNOU and IITs.
16. **Gyan darshan:** launched in 2000, **gyan darshan** is a joint effort of IGNOU and IITs. It is a bouquet of channels that broadcast educational programmes for school kids, university students and adults.

Concept of Social Learning

Web 2.0, social networking such as blogs and wikis, YouTube, iTunes and Big Think are influencing a new trend in higher education. The emergence of smartphones such as the iPhone and other intelligent devices has enhanced mobile learning. These technologies create new channels for content delivery, online video expansion and podcasting.

E-journal consortia:-

AICTE-INDEST is a consortium set up by the Ministry of Human Resource to enhance greater access and generate annual savings in access of bibliographic databases.

Indian space programme:-

Indian Space Research Organization (ISRO) has established two major space systems. Firstly, it is India National Satellite System (INSAT) that is Geo-stationary satellites for communication, TV broadcasting. Secondly it is Indian Remote Sensing Satellites, used for resource monitoring. A transponder is a wireless communication device that picks up and responds to incoming signals. India's first **EDUSAT (GSAT-3)** was launched in **2007**. Ku bandwidth (12-18 Ghz) is mostly used for satellite TV and VSAT systems. Ka-bandwidth (26.5-40Ghz) is used in high definition satellite TV. D Band has the highest bandwidth and L-band has the lowest bandwidth. India's first moon mission Chandrayan I was launched in the year 2003. Meteorological satellites (METSAT-I, II etc.) have been named after kalpana Chawla. (kalpana-I, Kalpana-II).

PAL, NTSC & SECAM

These are three video formats used in the world, where each one is incompatible with the other and these are PAL, NTSC & SECAM.

1. **Phase Alternating Line (PAL):** PAL is a video signal standard. Its increased bandwidth allows for better picture quality. It is the analogue TV format which is used in majority of Western Europe and other major areas such as china, India, Australia.
2. **National Television System Committee (NTSC):** It is mainly used in North American countries such as USA & Canada. This was the 1st colored TV broadcast system. NTSC is also used in Asia.
3. **Sequential Couleur Avec Memorie (SECAM):** It is also known as sequential color with memory. It is used mainly in France and many other western European countries

PRASAR BHARATI

It is a statutory autonomous body established under the Prasar Bharati Act. The board came into existence in 1997. Prasar Bharati is the public service broadcaster of the country. The objective of public service broadcasting is achieved through All India Radio and DD which were earlier working as independent media units under the Ministry of Information and Broadcasting.

All India Radio

Broadcasting started in India during 1972 with two privately owned transmitters, one at Bombay and the other at Calcutta, which were taken over by the Government in 1930. These operated under the name Indian Broadcasting Service until 1936 when it was given the present name AIR. It came to be known as Akashvani from 1957 onwards.

Doordarshen

The experimental telecast started in Delhi in September 1959 with a small transmitter and a makeshift studio. The regular daily transmission started in 1965. The TV service was extended to a second city Bombay in 1972. Till 1975 only seven cities were covered by the TV.

TV was separated from radio in 1976 and DD came into existence, National Programme was introduced in 1982 and from then, there has been a steady progress in DD. Swasth Bharat is the world's biggest health communication initiative launched on DD.

The Internet Protocol Television (IPTV)

It is a digital TV that is delivered through high-speed internet connection. In this service, channels are encoded in IP format and delivered to the TV through a set-top box that is required at the customers' location.

Main News Agencies in India

1. **Press Trust of India (PTI):** PTI was founded in 1947 and started its service in 1949. PTI is a non-profit sharing cooperative owned by the country's newspaper with a mandate to provide efficient and unbiased news to all the subscribers.
2. **United News of India (UNI):** UNI was incorporated in 1959 and started its functioning in 1961. It started its first news agency in India, a full-fledged Hindi wire service called Univarta in 1982 and also started the first ever service in Urdu. UNI distributes world news from Reuters.
3. **Press Council of India:** PCI is a quasi-judicial authority mandated by the parliament to preserve the freedom of press and maintain and improve the standard of newspapers and news agencies in India.

Computer: A computer is a truly amazing machine that performs a specified sequence of operations as per the set of instructions (known as programs) given on a set of data (input) to generate desired information (output).

Generation & Description

1 First Generation (1946-1959) – Vacuum tube based

2 Second Generation (1959-1965) – Transistor based

3 Third Generation (1965-1971) – Integrated Circuit based

4 Fourth Generation (1971-1980) – VLSI microprocessor based

5 Fifth Generation (1980-onwards) – ULSI microprocessor based

Computer hardware consists of the following components:

1. CPU (Central Processing Unit): CPU is considered as the brain of the computer. It performs all types of data processing operations, stores data, intermediate results and instructions (program).

CPU itself has following three components:

ALU (Arithmetic Logic Unit): When the control unit encounters an instruction that involves mathematical calculation or decision/logic, it passes the control to the second component, i.e., the arithmetic logic unit (ALU). The ALU includes a group of registers – memory locations built directly into the CPU – that are used to hold data that are being processed by the current.

Registers: The register is the smallest high-speed storage area in the CPU. All data must be represented in a register before it can be sent to other units.

Control Unit: This unit controls the operations of all parts of computer but does not carry out any actual data processing operations.

2. Primary memory consists of mainly two types of memories:

Random Access Memory (RAM): RAM is the internal memory of the CPU for storing data, program and program result. It is read/write memory which stores data until the machine is working. As soon as the machine is switched off, data is erased.

RAM is volatile, i.e. data stored in it is lost when we switch off the computer or if there is a power failure. Hence a backup uninterruptible power system (UPS) is often used with computers. RAM is small, both in terms of its physical size and in the amount of data it can hold.

There are mainly three types of RAM available:

Dynamic Random Access Memory (DRAM): A type of physical memory used in most personal computers. The term dynamic indicates that the memory must be constantly refreshed or it loses its contents.

Static Random Access Memory (SRAM): A type of memory that is faster and less volatile than DRAM, but requires more power and is more expensive. The term static is derived from the fact that it does not need to be refreshed like DRAM.

Read Only Memory (ROM): The memory from which we can only read but can not write on it. This type of memory is non-volatile. The information is stored permanently in such memories during manufacture. A ROM, stores such instructions that are required to start a computer. This operation is referred to as bootstrap.

There are mainly three types of ROM available:

MROM (Masked ROM): The very first ROMs were hard-wired devices that contained a pre-programmed set of data or instructions. These kinds of ROMs are known as masked ROMs.

EPROM (Erasable and Programmable Read Only Memory): The EPROM can be erased by exposing it to ultra-violet light for a duration of up to 40 minutes.

EEPROM (Electrically Erasable and Programmable Read Only Memory): The EEPROM is programmed and erased electrically. It can be erased and reprogrammed about ten thousand times. Both erasing and programming take about 4 to 10 ms (milli second).

Memory

A memory is just like a human brain. It is used to store data and instructions. Computer memory is the storage space in a computer where data is to be processed and instructions required for processing are stored. The memory is divided into a large number of small parts called cells. Each location or cell has a unique address which varies from zero to memory size minus one.

Memory is primarily of three types –

Cache Memory: It is a very high-speed semiconductor memory which can speed up CPU. It acts as a buffer between the CPU and main memory.

Primary Memory/Main Memory: Primary memory holds only those data and instructions on which computer is currently working. It has limited capacity and data is lost when power is switched off.

Secondary Memory: This type of memory is also known as external memory or non-volatile. It is slower than main memory. These are used for storing data/Information permanently.

1. Secondary Storage (External Storage Devices): Floppy diskettes, hard disk, tapes and optical disks come under the category of external storage devices or ancillary storage devices. These devices are very sensitive to environmental conditions (humidity and temperature) as well as to external magnetic fields and need to be stored.

Floppy Disk: Floppy disks are primarily used on PCs. Information on a floppy disk is recorded in the magnetized states of particles of iron oxides evenly placed upon concentric circles known as Tracks.

Hard Disk: It is a non-removable enclosed magnetic disk included in most PCs. It contains a stack of metal platters, each coated with iron oxide, that spin on a spindle and the entire unit is encased in a sealed chamber.

Magnetic Tape: This is plastic tape, usually made of Mylar that is coated with iron oxide, thereby enabling the introduction (writing); retention (memory) and reading of magnetically recorded information. The best use of tape storage is for data that you do not use very often.

Peripherals: Peripheral devices are devices connected to the computer externally. If a peripheral device is disconnected, the computer will still be able to work; only functions performed by this peripheral device will not be available.

Mainly there are following types of peripheral devices:

A. Input Devices (How to tell it what to do): This unit makes a link between user and computer. The input devices translate the information into the form understandable by the user.

1. Keyboard- The most common and very popular input device which helps in inputting data to the computer.

2. Mouse- Mouse is the most popular pointing device and cursor-control device having a small palm size box with a round ball at its base which senses the movement of mouse and sends corresponding signals to CPU when the mouse buttons are pressed.

3. Joy Stick- To move cursor position on a monitor screen. It is mainly used in Computer Aided Designing (CAD) and playing computer games.

4. Light pen- It is used to select a displayed menu item or draw pictures on the monitor screen.

5. Track Ball- Mostly used in notebook or laptop computer, instead of a mouse. This is a ball which is half inserted and by moving fingers on ball, pointer can be moved.

6. Scanner- A scanner allows you to scan printed material and convert it into a file format that may be used within the PC.

7. Digitizer- It converts analog information into digital form.

8. Microphone- Microphone is an input device to input sound that is then stored in digital form.

9. Magnetic Ink Character Recognition (MICR)- MICR input device is generally used in banks because of a large number of checks to be processed every day.

10. Optical Character Reader (OCR)- OCR scans text optically character by character, converts them into a machine-readable code and stores the text on the system memory.

11. Bar Code Reader- A device used for reading bar coded data (data in form of light and dark lines). Barcoded data is generally used in labeling goods, numbering the books.

12. Optical Mark Reader (OMR)- A special type of optical scanner used to recognize the type of mark made by pen or pencil.

B. Output Devices: (How it shows you what it is doing) Output devices translate the computer's output into the form understandable by

Monitors: Monitors, commonly called as Visual Display Unit (VDU), are the main output device of a computer. It forms images from tiny dots, called pixels that are arranged in a rectangular form. The sharpness of the image depends upon the number of pixels.

There are two kinds of viewing screen used for monitors.

1. Cathode-Ray Tube (CRT): The CRT display is made up of small picture elements called pixels. The smaller the pixels, the better the image clarity, or resolution

2. Flat- Panel Display: The flat-panel display refers to a class of video devices that have reduced volume, weight and power requirement in comparison to the

Printer: Printer is an output device, which is used to print information on paper.

1. Impact Printers: The impact printers print the characters by striking them on the ribbon.

2. Non-Impact Printers: Non-impact printers print the characters without using ribbon.

Language Processors:

- ✓ **Assembler:** This language processor converts the program written in assembly language into machine language.
- ✓ **Interpreter:** This language processor converts a HLL (High Level Language) program into machine language by converting and executing it line by line.
- ✓ **Compiler:** It also converts the HLL program into machine language but the conversion manner is different. It converts the entire HLL program in one go, and reports all the errors of the program along with the line numbers.

Software: software represents the set of programs that govern the operation of a computer system and make the hardware run. **There are two types of software**

- **System Software:** The system software is collection of programs designed to operate, control, and extend the processing capabilities of the computer itself. System software are generally prepared by computer manufactures. System software serves as the interface between hardware and the end users. **Examples:** Operating System, Compilers, Interpreter, Assembler etc.
- **Application Software:** It is the set of programs necessary to carry out operations for a specified application.

Software categories

Freeware: Software which is completely costless .The producers of this software are either public institutions such as universities or developers who do it for personal interest or advertisement or private company who do it for dumping reasons.

Shareware: Software which is initially costless but after a certain period the user is asked to pay a fee or delete it. Or software which has two versions a free one, but incomplete or with advertisement banners and a complete advertisement free one for which the user must pay. The most common example is WinZip compression program.

Commercial: Software for which the user has to pay a license to use it .Common examples are Microsoft Windows operating system and Microsoft word.

Private: Software uniquely built, under payment for a specific customer to fit his need. Only the customer may use it.

Open Source: Software may be modified by anyone, sometimes under certain restrictions. Open source software is also freeware.

Proprietary: Software is distributed with the explicit with the explicit legal warning not to modify it and technically locked to prevent other developers to see or modify its source.

Operating System

An Operating system is a program, which acts as an interface between a user and the hardware.

Characteristics of Operating System:

Memory Management — keeps tracks of primary memory i.e. what part of it is in use by whom, what part is not in use etc. and allocates the memory when a process or program requests it.

Processor Management — allocates the processor (CPU) to a process and de-allocates processor when it is no longer required.

Device Management — keeps track of all devices. This is also called I/O controller that decides which process gets the device, when, and for how much time.

File Management — allocates and de-allocates the resources and decides who gets the resources.

Security — prevents unauthorized access to programs and data by means of passwords and similar other techniques.

Job accounting — keeps track of time and resources used by various jobs and/or users.

Control over system performance — records delays between the request for a service and from the system.

Interaction with the operators — The interaction may take place via the console of the computer in the form of instructions. Operating System acknowledges the same, does the corresponding action and informs the operation by a display screen.

Error-detecting aids — Production of dumps, traces, error messages and other debugging and error-detecting methods.

Coordination between other software and users — Coordination and assignment of compilers, interpreters, assemblers and other software to the various users of the computer systems.

MS – Window

MS-Windows is a **GUI (Graphic User Interface)** based operating system. In Windows Operating system multiple applications can be simultaneously run in different windows.

In MS-Windows, the screen upon which icons, windows, too are displayed is known as Desktop.

An icon is a graphic symbol that represents a window element like, file, folder, or shortcut.

Loading up of operating system files into the computer's memory is called **booting up**.

The taskbar is a bar, which is usually located at the bottom of the screen.

My computer is helpful for viewing the contents of a single folder or drive.

Windows Explorer is another way of seeing what is on your computer. Windows Explorer shows the computer's contents as a hierarchy.

File: A program or document stored on a disk.

Toolbar: A set of buttons you click to perform common tasks.

A folder is a location in which you can store files and other folders.

To create a new folder, File—New—Folder commands are clicked in My Computer windows.

To find files or folders, Start—Find—Files or Folder commands are clicked.

To create a shortcut to a file, firstly select the file or folder, whose shortcut is to be created. Then drag the file icon through right mouse button to desired

location where shortcut to be placed, and then select create shortcut(s).

To shut down the computer, Start—Shut Down commands are clicked.

COMPUTER ABBREVIATIONS:

AGP → Accelerated Graphic Port

PC → Personal Computer

EPROM → Erasable Programmable Read Only Memory


















BIOS → Basic Input and Output System

HDD → Hard Disk Drive

PCI → Peripheral Component Interconnect

UNIVAC → Universal Automatic Computer

✚	GUI →Graphic User Interface
✚	USB →Universal Serial Bus
✚	VGA →Visual Graphic Adaptor
✚	MAN →Metropolitan Area Network
✚	ASCII →American Standard Code for Information Interchange
✚	WAN →Wide Area Network
✚	EBCDIC →Extended Binary Coded Decimal Interchange Code
✚	LAN →Local Area Network
✚	EEPROM/EAPROM →Electrical Erasable/Alterable Programmable Read Only Memory
✚	CPU →Central Processing Unit
✚	OS →Operating System
✚	ALU →Arithmetic and Logic Unit
✚	DVD →Digital Versatile Disc
✚	CD → Compact Disk
✚	ROM →Read Only Memory
✚	VDU →Visual Display Unit
✚	RAM →Random Access Memory
✚	ICT →Information Communication Technology
✚	PROM →Programmable Read Only Memory
✚	URL →Universal Resource Locator
✚	IDE →Integrated Drive Electronics
✚	FORTTRAN → Formula Translator
✚	MOS → Meta-oxide Semi-Conductor
✚	ATX →Advanced Technology Extended
✚	SIM →Subscriber Identification Module
✚	MHZ →Megahertz
✚	ISP →Internet Service Provider
✚	GHZ →Gigahertz
✚	DBMS →Database Management System
✚	SQL →Structured Query Language
✚	RW →Re-Writeable
✚	SDT →Serial Data Transmission
✚	CAN →Campus Area Network
✚	SIMMs →Single In-line Memory Module
✚	PAN →Personal Area Network
✚	DIMMs →Dual In-line Memory Module
✚	CMOS →Complimentary Metaoxide Semi-Conductor
✚	ENIAC →Electronic Number Integrator And Calculator
✚	CMD → Command
✚	EDSAC →Electronic Dialog Storage Automatic Computer
✚	MAC →Media Access Control
✚	IC →Integrated Circuit
✚	LSIC →Large Scale Integrated Circuit
✚	DIR →Directory
✚	GIGO →Gabbage In Gabbage Out
✚	PHP →PHP Hypertext Preprocessor
✚	DOC →Document
✚	PDT →Parallel Data Transmission
✚	PDA →Personal Digital Assistant
✚	USSD →Unstructured Supplementary Service Data
✚	WWW →World Wide Web

-  **COBOL** → Common Basic Oriented Language
-  **CCNP** → Cisco Certified Network Professionals
-  **BASIC** → Beginner All Purpose Symbolic Instruction Code
-  **CEH** → Certified Ethical Hacking
-  **TCP** → Transmission Control Protocol
-  **CSS** → Cascading Style Sheet
-  **CISCO** → Computer Information System Company
-  **XXS** → Cross Site Scripting
-  **XML** → Extensible Mark-up Language
-  **HTML** → Hypertext Markup Language
-  **CCNA** → Cisco Certified Network Associate
-  **RFI** → Remote File Inclusion
-  **HTTP** → Hypertext Transfer Protocol
-  **DDOS** → Distribution Denial Of Service
-  **VPN** → Virtual Private Network
-  **SEO** → Search Engine Optimization
-  **IP** - Internet Protocol

Operating Systems and Data

Storage Based

BIOS – This is the Basic Input Output System which controls the computer, telling it what operations to perform. These instructions are on a chip that connects to the motherboard.

BYTE – A byte is a storage unit for data.

“K” is a Kilobyte which is 1024 bytes.

“MB” is a Megabyte which is a million bytes.

“GB” is a Gigabyte, which equals 1000 megabytes.

CPU – This stands for the Central Processing Unit of the computer. This is like the computer’s brain.

MAC – This is an abbreviation for Macintosh, which is a type of personal computer made by the Apple Computer company.

OS – This is the Operating System of the computer. It is the main program that runs on a computer and begins automatically when the computer is turned on.

PC – This is the abbreviation for personal computer. It refers to computers that are IBM compatible.

PDF – This represents the Portable Document Format which displays files in a format that is ready for the web.

RAM – This stands for Random Access Memory which is the space inside the computer that can be accessed at one time. If you increase the Amount of RAM, then you will increase the computer’s speed. This is because more of a particular program is able to be loaded at one time.

ROM – This is Read Only Memory which is the instruction for the computer and cannot be altered.

VGA – The Video Graphics Array is a system for displaying graphics. It was developed by IBM.

WYSIWYG – This initialize stands for **What You See Is What You Get**. It is pronounced “wizziwig” and basically means that the printer will print what you see on your monitor.

NETWORKING

Network: Computer Networks means an interconnected set of autonomous system that permits distributed processing to information.

Internet: internet is a global system of interconnected computer networks that use the standard internet protocol to serve millions of users worldwide. The department of defense of USA created Advanced Research Projects Agency (ARPA) in response to the Soviet Union's launching Sputnik in 1957.

Local Area Network (LAN): A local area network is a relatively smaller and privately owned network with the maximum span of 10 km.

Metropolitan Area Network (MAN): MAN is defined for less than 50 Km and provides regional connectivity within a campus or small geographical area.

Wide Area Network (WAN): A Wide Area Network (WAN) is a group Communication Technology, provides no limit of distance.

Types of Network

1. Point to Point Network: When a packet is sent from one router to another intermediate router, the entire packet is stored at each intermediate router, stored there till the output line is free and then forwarded. A subnet using this principle is called point to point or packet switched network.

Topologies for a point to point Subnet:

Star: Each device has a dedicated point to point link only to a central controller, usually called a hub.

Tree: A tree topology is a variation of a star.

Ring: Each device has a dedicated point to point line configuration only with the two devices on either side of it.

Bus: One long cable acts as a backbone to link all the devices in the network.

2. Broadcast Networks: Broadcast networks have a single communication channel that is shared by all the machines on the network.

Network Cables: Network cables are used to connect computers. The most commonly used cable is Category 5 cable RJ-45.

Distributors: A computer can be connected to another one via a serial port but if we need to connect many computers to produce a network, this serial connection will not work. The solution is to use a central body to which other computers, printers, scanners etc. can be connected and then this body will manage or distribute network traffic.

Repeaters: A repeater is an electronic device that receives a signal and retransmits it at a higher level or higher power, or onto the other side of an obstruction, so that the signal can cover longer distance.

Bridge: A bridge is a product that connects a local area network (LAN) to another local area network that uses the same protocol (for example, Ethernet or token ring).

Routers: A router is a device that forwards data packets along networks. A router is connected to at least two networks, commonly two LANs or WANs or a LAN and its ISP's network. Routers are located at gateways, the places where two or more networks connect.

Internal Network Cards: Network card is a necessary component of a computer without which a computer cannot be connected over a network. It is also known as network adapter or Network Interface Card (NIC). Most branded computers have network card pre-installed. Network cards are of two types: Internal and External Network cards.

External Network Cards: External network cards come in two flavours like Wireless and USB based. Wireless network card need to be inserted into the Motherboard but no network cable is required to connect to network.

Universal Serial Bus (USB): USB card are easy to use and connect via USB port. Computers automatically detect USB card and can install the drivers required to support the USB network card automatically.

Modem (Modulator –DE Modulator): Modem is a device attached to computers that can convert digital signals to analog signals to analog signals and vice-versa.

Connecting to the Internet

Network Based

FTP – This is a service called File Transport Protocol which moves a file between computers using the Internet.

HTML – Hyper-Text Markup Language formats information so it can be transported on the Internet.

HTTP – Hypertext Transfer Protocol is a set of instructions for the software that controls the movement of files on the Internet.

IP – This stands for Internet Protocol which is the set of rules that govern the systems connected the Internet. IP Address is a digital code specific to each computer that is hooked up to the Internet.

ISP – The Internet Service Provider is the company which provides Internet service so you can connect your computer to the Internet.

LAN – This stands for Local Area Network which is the servers that your computer connects to in your geographic area.

PPP – Point-to-Point Protocol is the set of rules that allow your computer to use the Internet protocols using a phone line and modem.

URL – This is the Uniform Resource Locator which is a path to a certain file on the World Wide Web.

USB – The Universal Serial Bus is used for communications between certain devices. It can connect keyboards, cameras, printers, mice, flash drives, and other devices. Its use has expanded from personal computers to PDAs, smart phones, and video games, and is used as a power cord to connect devices to a wall outlet to charge them.

VR – Virtual Reality simulates a three dimensional scene on the computer and has the capability of interaction. This is widely used in gaming.

VRML – Virtual Reality Mark-up Language allows the display of #D Images.

ELECTRONIC MAIL (e-mail): Electronic Mail (e-mail) was invented by “John Von Neumann”. Electronic Mail transfers the data from one system to another system in the form of messages (text), pictures (images), and Multimedia messages.

An e-mail address normally consists of three parts.

1. **Name of the User**
2. **“@” Sign**
3. **3rd part comes after @ sign and it is the name of the DNS**

To view an e-mail, you have to use e-mail software is “Outlook Express”.

In the e-mail window, you can find “Folder Pane” at the left side of the window. It has set of folders named as Composed email, Inbox, Out Box, Sent Items, Drafts, Trash, Spam etc.,

Inbox is used to store incoming

Outbox is used to store outgoing email before it is Sent Items is used to store email that has already been

Deleted Items (Trash) is used to store deleted email up to 30

A draft folder is used to store email that is not yet complete.

Spam is used to store the unsolicited bulk e-mail up to 30

Compose Mail is use to create a new

To : To type the e-mail address of the person to whom you want to send an email in this

Subject : To type a few words about the subject of the letter you want to

CC (Carbon Copy) : To type the e-mail address of the other recipients in this box, each address is separated by a comma (,). When you complete the mail and click the “Send” button, then the mail will automatically be sent to all the recipients. Here, all the recipients will know who the other recipients

BCC (Band Carbon Copy) or (Blind Curtsey Copy) : If you don’t want them to know who else have received copies, you can type the addresses in the BCC text In this case, only you (the sender) will know the identity of all the recipients of mail.

Reply: You can send your reply using the same subject box will have the same subject, but with the words “Re:” before it.

Forward: You can send the forward message using the same The subject box will have the same subject, but with the words “Fwd:” before it.

An email attachment is a computer file sent along with an email message. One or more files can be attached to any email message, and be sent along with it to the first email was sent by **Ray Tomlinson to himself in 1971.**

The Drafts folder retains copies of messages that you have started but are not yet ready to send.

Hotmail, a free e-mail service provided by Microsoft which was established in 1995 was co-founded by an Indian American entrepreneur Sabeer Bhatia along with Jack Smith in July of 1996.

An Internet Protocol address (also known as an IP address) is a numerical label assigned to each device (e.g., computer, printer) participating in a computer network. It acts as an identifier for a computer. It is a unique address for every computer.

Top-level domain: Each part of a domain name contains certain information. The first field is the hostname, identifying a single computer or organization. The last field is the top-level domain, describing the type of organization and occasionally country of origin associated with the For e.g. – .com – Commercial, .edu-Educational.

E-COMMERCE

Electronic Commerce has changed the lifestyle of the society. With the help of e-commerce, it is possible to buy, sell and exchange the products, services and information through computer networks, primarily through the internet.

Application of E-Commerce

1. **Electronic payments:** this is the best form of payment across the universe at present. Electronic payments can be done through various ways such as through electronic cards, smart cards and through e-wallets.
2. **Banking gateway:** e-commerce plays a vital role in the banking sector for inter-bank transactions and building a separate gateway for the unified banking gateway.
3. **E-governance:** now the government of India has initiated total online transactions for tax payment, phone bill payments loan etc.

What is BHIM

Bharat Interface for Money (BHIM) is an initiative to enable fast, secure, reliable cashless payments through your mobile phone. BHIM is interoperable with other Unified Payments Interface (UPI) applications and bank accounts for quick money transfers online. BHIM is developed by the National Payment Corporation of India (NPCI) as a part of the Digital India initiative.

ICT & Governance

In 1954, W. Howard Gammon wrote e-government research paper for writing about the use of ICT for providing good governance. The internet, SMS and different mobile apps help people to access information quickly. The data access has become very cheap due to cost competitiveness among companies. Now they are being used in education, banking services, railway and other governance issues. The government has started utilization of internet to serve common people through e-governance.

Now governance contains information from and to both public and private sectors. It is helpful to get knowledge and deliver information utilizing the internet and World Wide Web instantly.

COMPUTER FULL FORMS

1. ***PAN*** - permanent account number.
2. ***PDF*** - portable document format.
3. ***SIM*** - Subscriber Identity Module.
4. ***ATM*** - Automated Teller machine.
5. ***IFSC*** - Indian Financial System Code.
6. ***FSSAI (Fssai)*** - Food Safety & Standards Authority of India.
7. ***Wi-Fi*** - Wireless fidelity
8. ***GOOGLE*** - Global Organization of Oriented Group Language Of Earth.
9. ***YAHOO*** - Yet another Hierarchical Official Oracle.

10. *WINDOW* - Wide Interactive Network Development for Office work Solution.
11. *COMPUTER* - Common Oriented Machine. Particularly united and used under Technical and Educational Research.
12. *VIRUS* - Vital Information Resources under Siege.
13. *UMTS* - Universal Mobile Telecommunications System
18. *UPS* - Uninterruptible power supply.
19. *HDMI* - High-Definition Multimedia Interface.
20. *VPN* - Virtual private network.
21. *APN* - Access Point Name.
22. *LED* - Light emitting diode.
23. *DLNA* - Digital Living Network Alliance.
24. *RAM* - Random access memory.
25. *ROM* - Read only memory.
26. *VGA* - Video Graphics Array.
27. *QVGA* - Quarter Video Graphics Array.
28. *WVGA* - Wide video graphics array.
29. *WXGA* - Widescreen Extended Graphics Array.
30. *USB* - Universal serial Bus.
31. *WLAN* - Wireless Local Area Network.
32. *PPI* - Pixels Per Inch.
33. *LCD* - Liquid Crystal Display.
34. *HSDPA* - High speed down-link packet access.
35. *HSUPA* - High-Speed Uplink Packet Access.
36. *HSPA* - High Speed Packet Access.
37. *GPRS* - General Packet Radio Service.
38. *EDGE* - Enhanced Data Rates for Global Evolution.
39. *NFC* - Near field communication.
40. *OTG* - On-the-go.
41. *S-LCD* - Super Liquid Crystal Display.
42. *O.S* - Operating system.
43. *SNS* - Social network service.
44. *H.S* - HOTSPOT.
45. *P.O.I* - Point of interest.
46. *GPS* - Global Positioning System.
47. *DVD* - Digital Video Disk.
48. *DTP* - Desk top publishing.
49. *DNSE* - Digital natural sound engine.
50. *OVI* - Ohio Video Intranet.
51. *CDMA* - Code Division Multiple Access.
52. *WCDMA* - Wide-band Code Division Multiple Access.
53. *GSM* - Global System for Mobile Communications.
54. *DIVX* - Digital internet video access.
55. *APK* - Authenticated public key.
56. *J2ME* - Java 2 micro edition.
57. *SIS* - Installation source.
58. *DELL* - Digital electronic link library.
59. *ACER* - Acquisition Collaboration Experimentation Reflection.
60. *RSS* - Really simple syndication.
61. *TFT* - Thin film transistor.
62. *AMR* - Adaptive Multi-Rate.
63. *MPEG* - moving pictures experts group.

64. *IVRS* - Interactive Voice Response System.

65. *HP* - Hewlett Packard.

66. *News paper* =* _North East West South past and present events report.

Concepts of data representation in digital computers:

Data and instructions cannot be entered and processed directly into computers using human language. Any type of data be it numbers, letters, special symbols, sound or pictures must first be converted into machine-readable form i.e. binary form. Due to this reason, it is Important to understand how a computer together with its peripheral devices handles data in its electronic circuits, on magnetic media and in optical devices.

Data representation in digital circuits:

Electronic components, such as microprocessor, are made up of millions of electronic circuits. The availability of high voltage(on) in these circuits is interpreted as '1' while a low voltage (off) is interpreted as '0'. This concept can be compared to switching on and off an electric circuit. When the switch is closed the high voltage in the circuit causes the bulb to light ('1' state). on the other hand when the switch is open, the bulb goes off ('0' state). This forms a basis for describing data representation in digital computers using the binary number system.

Data representation on magnetic media:

The laser beam reflected from the land is interpreted, as 1. The laser entering the pit is not reflected. This is interpreted as 0. The reflected pattern of light from the rotating disk falls on a receiving photoelectric detector that transforms the patterns into digital form. The presence of a magnetic field in one direction on magnetic media is interpreted as ; while the field in the opposite direction is interpreted as "0". Magnetic technology is mostly used on storage devices that are coated with special magnetic materials such as iron oxide. Data is written on the media by arranging the magnetic dipoles of some iron oxide particles to face in the same direction and some others in the opposite direction.

Bits, bytes, nibble and word:

The terms bits, bytes, nibble and word are used widely in reference to computer memory and data size.

Bits: can be defined as either a binary, which can be 0, or 1. It is the basic unit of data or information in digital computers.

Byte: a group of bits (8 bits) used to represent a character. A byte is considered as the basic unit of measuring memory size in computer.

A nibble: is half a byte, which is usually a grouping of 4 bits.

Word: two or more bits make a word. The term word length is used as the measure of the number of bits in each word. For example, a word can have a length of 16 bits, 32 bits, 64 bits etc

Some Basic Terminology

• **Bit**– is the smallest piece of information used by the computer. Derived from "binary digit". In computer language, is short for Binary Digit. Bits have value of 1 or 0, (or on or off, or, true or false).

✚ 8 Bits make up 1 Byte.

✚ 1024 Bytes make up 1 KByte (1 KiloByte or 1K), (Because $2^{10} = 1024$).

✚ 1024 KBytes make up 1 MByte (1 MegaByte or 1M).

✚ 1024 MBytes make up 1 GByte (1 GigaByte or 1G).

• All machines have a word size – a fundamental unit of storage, for example, 8-bits, 16-bits, etc. The size of a word (in Bytes) differs between machines. A Pentium based machine is 32-bit.

• Parallel processing occurs when two or more CPUs work on solution of the same problem at the same time

- **Access time**–The performance of a hard drive or other storage device– how long it takes to locate a file.
- **Active program or window**– The application or window at the front (foreground) on the monitor.
- **Alert box**– a message that appears on screen, usually to tell you something went wrong.
- **Application**– a program in which you do your work.
- **ASCII (pronounced ask-key)** – American Standard Code for Information Interchange. a commonly used data format for exchanging information between computers or programs.
- **Boot**– to start up a computer.
- **Bug** –A programming error that causes a program to behave in an unexpected way.
- **Bus** –An electronic pathway through which data is transmitted between components in a computer.
- **Card**– a printed circuit board that adds some feature to a computer.
- **CD-ROM**– An acronym for Compact Disc Read-Only Memory.
- **Clock Rate (MHz)**– The instruction processing speed of a computer measured in millions of cycles per second (i.e., 200 MHz).
- **Compiler**– a program the converts programming code into a form that can be used by a computer.
- **Compression**– a technique that reduces the size of a saved file by elimination or encoding redundancies (i.e., JPEG, MPEG, LZW, etc.)
- **Control panel**– a program that allows you to change settings in a program or change the way a Mac looks and/or behaves.
- **CPU**– the Central Processing Unit. The processing chip that is the “brains” of a computer.
- **Crash**– a system malfunction in which the computer stops working and has to be restarted.
- **Cursor**– The pointer, usually arrow or cross shaped, which is controlled by the mouse.
- **Daisy chaining** – the act of stringing devices together in a series (such as SCSI).
- **Windows:**
 - i. The most widely used operating system for personal computers from Microsoft. (Software only. Other companies manufacture the hardware that runs the Windows Operating System.) Compare Macintosh. (Windows with a large “W”.)
 - ii. The thing you see on screen that contains a directory listing or the contents of a document. (Window with a small “w”.)
- **Trash:** Place where you put files and folders that you want to delete or get rid of.
- **System files:** Allows our computer to work.
- **Software:** Instructions that tell the computer what to do.
- **Shut down:** To quit all applications and turn off the computer
- **Scroll bar:** Allows you to move around through your document.
- **Save As :** Give the file a name and/or store the file in a certain place.
- **Save:** Tell the computer to create a file on disk that has the information you’ve put into the document (usually typing).
- **Right click:** To press the right button on the mouse. (This is Windows specific. On a Mac running System or higher, you hold down the Control key and then click to get the same effect.)
- **Recycle Bin:** Place where you put files and folders that you may later want to delete or get rid of. Compare Trash.
- **Random Access Memory (RAM):** This stands for Random Access Memory. You can think of this as the “space” where you computer does its processing. The more space you have the more processes you can run at the same time. More RAM is always better than less. You can never have much RAM.
- **Pointer (Cursor):** The name of the arrow (or other shape) that tracks across the screen as you move the mouse (or other pointing device) around.
- **Operating System (OS):** System software that allows your computer to work.
- **Mouse:** Pointing device that allows you to tell the computer what to do.
- **MegaHertz (Mhz):** This stands for MegaHertz. A hertz is an electronics term. 1 hz = one cycle (or wavelength) per second. 1 megahertz = 1,000,000 cycles per second. In computer jargon, Mhz

measures how *fast* your CPU chip runs. Although it's more important to know the chip than the speed, if you're comparing the same kind of CPU chip then a higher / faster CPU speed (measured in MHz) is better than a slower speed.

- **Macintosh:** The brand name of a family of personal computers (hardware) and an operating system (software) from Apple, introduced in 1984.
- **Keyboard:** This is the primary text input device. It also contains certain standard function keys, such as the Escape key, tab, and arrow keys, shift and control keys, and sometimes other manufacturer-customized keys.
- **Icons:** In a graphical user interface (GUI), a small, pictorial, on screen representation of an object, such as a document, program, folder or disk drive.
- **Folder (Directory, Sub-Directory):** Allows you to organize files and other folders.
- **Folder Icons:** Collections of documents and other folders.
- **Edit:** To make a change to existing data
- **Drag:** To move an object on screen in which its complete movement is visible from starting location to destination.
- **Double Click:** To press the mouse button twice in rapid succession without moving the mouse between clicks.
- **Documents:** Files you create and edit.
- **Disk Space:** This is the place where your files live. The greater the disk space the more files you can keep. More disk space is always better than less. You can never have much disk space.
- **Desktop:** An on-screen representation of a desktop such as used in the Macintosh and Windows operating systems.
- **Delete:** To remove an item of data from a file or to remove a file from the disk.
- **Creating A File:** Storing data as a file with an assigned file name that is unique within the directory it resides in.
- **Crash:** Your computer or application no longer works correctly and so you "lose" all the work you've done since the last time you saved.
- **Central Processor Unit (CPU) :** This term has two meanings
 - i. Central Processor Unit—the main chip on the computer that makes everything go.
 - ii. The box that holds the guts of the computer.
 A faster CPU is always better than a slower one. You can never have too fast of a CPU.
- **Compute:** A general-purpose machine that processes data according to a set of instructions that are stored internally either temporarily or permanently.
- **WORM:** Acronym for Write Once-Read Many; an optical disk that can only be written to once (like a CD-ROM).
- **vaporware:** "software" advertised, and sometimes sold, that does not yet exist in a releasable form.
- **UPS:** acronym for "Uninterruptible Power Source", a constantly charging battery pack which powers the computer. A UPS should have enough charge to power your computer for several minutes in the event of a total power failure, giving you time to save your work and safely shut down.
- **Upload:** To send a file from one computer to another through a network.
- **System folder:** an all-important folder that contains at least the System file.
- **System file:** a file in the System folder that allows your Mac to start and run.
- **Startup disk:** the disk containing system software and is designated to be used to start the computer.
- **Spreadsheet:** a program designed to look like an electronic ledger as in Excel.
- **Server:** a central computer dedicated to sending and receiving data from other computers (on a network).
- **Serial port:** a port that allows data to be transmitted in a series (one after the other), such as the printer and modem ports on a Mac.
- **SCSI:** acronym for Small Computer System Interface.

- **SCSI address:** a number between zero and seven that must be unique to each device in a SCSI chain. Fast and Wide SCSI devices will allow up to 15 SCSI Ids (hexadecimal); however, the length restriction (3 meters) is such that it is virtually impossible to link 15 devices together.
 - **SCSI port:** a 25 pin connector on the back of a Mac (native SCSI port); used to connect SCSI devices to the CPU.
 - **Root directory:** the main hard drive window.
 - **ROM:** acronym for Read Only Memory; memory that can only be read from and not written to.
 - **RISC:** acronym for Reduced Instruction Set Computing; the smaller set of commands used by the PowerPC and Power Mac.
 - **RAM:** Acronym for Random-Access Memory.
 - **QuickTime:** the Apple system extension that gives one the ability to compress, edit and play animation, movies and sound on the Mac.
 - **Print spooler:** a program that stores documents to be printed on the hard drive, thereby freeing the memory up and allowing other functions to be performed while printing goes on in the background.
 - **PCI:** acronym for Peripheral Component Interchange - the newer, faster bus architecture.
 - **Paste:** to insert text, or other material, from the clipboard or copy buffer.
 - **Partition:** a subdivision of a hard drives surface that is defined and used as a separate drive.
 - **Optical disk:** a high-capacity storage medium that is read by a laser light.
 - **Nanosecond:** one billionth of a second.
 - **Multi-tasking:** running more than one application in memory at the same time.
 - **Memory:** the temporary holding area where data is stored while it is being used or changed; the amount of RAM a computer has installed.
 - **Megabyte:** 1024 kilobytes.
 - **Database:** an electronic list of information that can be sorted and/or searched.
 - **Defragment:** to concatenate fragments of data into contiguous blocks in memory or on a hard drive.
 - **digitize:** to convert linear, or analog, data into digital data which can be used by the computer.
 - **Disk spinning** platter made of magnetic or optically etched material on which data can be stored.
 - **Disk drive:** the machinery that writes the data from a disk and/or writes data to a disk.
 - **DOS:** acronym for Disk Operating System - used in IBM PCs.
 - **DPI:** acronym for Dots Per Inch - a gauge of visual clarity on the printed page or on the computer screen.
 - **Download:** to transfer data from one computer to another. (If you are on the receiving end, you are downloading. If you are on the sending end, you are uploading).
 - **Driver:** a file on a computer which tells it how to communicate with an add-on piece of equipment (like a printer).
 - **Ethernet:** a protocol for fast communication and file transfer across a network.
 - **Font :** a typeface that contains the characters of an alphabet or some other letterforms.
 - **Fragmentation:** The breaking up of a file into many separate locations in memory or on a disk.
 - **Freeze:** a system error which causes the cursor to lock in place.
 - **Hard drive:** a large capacity storage device made of multiple disks housed in a rigid case.
 - **Head crash:** a hard disk crash caused by the heads coming in contact with the spinning disk(s).
 - **icon:** a graphic symbol for an application, file or folder.
- * 1024 bytes =one kilobyte
 - * K= kilobyte
 - * Kb = kilobit
 - * MB= megabyte
 - * Mb= megabit
 - * MB/s = megabytes per second
 - * Mb/s= megabits per second

* bps= bits per second

EXPECTED MCQs

1. Which of the following is also termed as multimedia education?

- | | |
|----------------------------|----------------------|
| a. ICT supported education | c. ICT education |
| b. ICT enabled education | d. None of the above |

Answer: a

2. CBT stands for

- | | |
|----------------------------|------------------------|
| a. Central basic training | c. computer basic test |
| b. Computer based training | d. none of the above |

Answer: b

3. NPTEL stand for

- | |
|---|
| a. national programme on technology enhanced learning |
| b. national programme on technology enabled learning |
| c. national programme on technology enhanced lessons |
| d. national programme on technology embedded learning |

Answer: a

4. the ERNET stands for

- | | |
|-------------------------------------|-------------------------------------|
| a. Engineering and research network | c. educational and research network |
| b. External and regulated network | d. none of the above |

Answer: c

5. At which of the following institutions ERNET is used to connect computers?

- | | |
|----------|--|
| a. IISCs | c. National center for software technology |
| b. IITs | d. All of the above |

Answer: d

6. Which of the following is not included in the four basic dimensions of ICT?

- | | | | |
|-----------|-------------------|-------------|--------------|
| a. skills | b. infrastructure | c. attitude | d. personnel |
|-----------|-------------------|-------------|--------------|

Answer: c

7. Which of the following open source e-learning platform has been developed by IIT-Kanpur?

- | | | | |
|-----------|---------------|---------------|----------------------|
| a. e-gyan | b. e-sarawati | c. brihaspati | d. none of the above |
|-----------|---------------|---------------|----------------------|

Answer: c

8. recording a television programme on a VCR is an example of

- a. time-shifting b. content reference c. mechanical clarity d. media synchronization.

Answer: a

9. Which of the following is the main challenge in ICT adoption in Indian Universities

- a. Lack of technological readiness c. Linguistic barrier
b. Poor implementation of ICT initiative d. All of the above

Answer: d

10. Which of the following parameter are used for expansions of higher education?

- a. Access b. equity c. resources d. all of the above.

Answer: d

11. TKDL stands for

- a. Traditional knack digital library c. Transfer knowledge desktop literature
b. Traditional knowledge digital library d. Transfer knowledge digital library

Answer: b

12. Sending & receiving messages or signals occurring at the same time is denoted by

- a. Synchronous b. asynchronous c. both a & b d. none of the above

Answer: a

13. Video-conferencing is an example of

- a. Synchronous technologies c. Both synchronous & asynchronous
b. Asynchronous technologies d. None of the above

Answer: a

14. Which of the following terms can be used in the context of education through CDs?

- a. Synchronous c. Both a & b
b. Asynchronous d. None of the above

Answer: b

15. Digital divide is the term used in context of differentiation in use of IT/ICT?

- a. Developed and developing nation's
b. Urban and rural India
c. Both a & b
d. None of the above

Answer: c

16. In the hypermedia database, information bits are stored in the form of

- a. Signals b. Cubes c. Nodes d. Symbols

Answer: a

17. Communication bandwidth that has the highest capacity and used by microwave, cable and fibre optics lines is known as

- a. Hyperlink b. Broadband c. bus width d. carrier wave.

Answer: b

18. An electronic billboard that has a short text or graphical advertising message is referred to as

- a. Bulletin b. strap c. bridge lined . banner

Answer: b

19. The concept of connect intelligence is derived from

- a. Virtual reality c. Bluetooth technology
b. Fuzzy logic d. value-added networks

Answer: d

20. The function of mass communication of applying information regarding the processes, issues, events and societal developments is known as

- a. Content supply c. gratification
b. Surveillance d. correlation

Answer: b

21. Information and communication technology includes

- a. Online learning c. Web-based learning
b. Learning through the use of EDUSAT d. All of the above

Answer: d

22. Information that is a combination of graphics, text, sound, video and animation is called

- a. Multiprogramming c. Multimedia
b. Multifaceted d. Multiprocessor

Answer: c

23. Which of the following institutions launched a knowledge repository e-Gyankosh in 2005 that aims at storing and preserving digital resources?

- a. IIT-Kanpur
- b. IGNOU
- c. Allahabad University
- d. Delhi University

Answer: b

24. The institutions promoted by the department of IT to provide communication infrastructure and services to academic research institutions in India is

- a. INFLIBNET
- b. UGC
- c. ERNET
- d. none of the above

Answer: c

25. The bouquet of FM radio channels which broadcast programs contributed by institutions such as IGNOU and IITs is

- a. Gyan Vani
- b. Gyan Darshan
- c. EDUSAT
- d. None of the above

Answer: a

26. Which of the following institutions has been working in the direction to develop a Virtual Technical University in India?

- a. IGNOU
- b. NMCEIT
- c. UGC
- d. AICTE

Answer: d

27. The joint initiative of the IITs and IISc to provide e-Learning through online web and video courses in many streams, specifically engineering in the country by providing free online courseware is

- a. National programme on technology enhanced learning
- b. AICTENET
- c. NMCEIT
- d. None of the above

Answer: a

28. Which organization has been assigned the task to develop e-content of 996 courses belonging to engineering, sciences, technology, humanities and management?

- a. IIT- Madras
- b. BITS Pilani
- c. IIT-Mumbai
- d. none of the above

Answer: a

29. 'A-view', the software that has been developed under the NMEICT is basically developed for

- a. Teachers training
- b. Technical training
- c. Students training
- d. None of the above

Answer: a

30. Web 2.0 tools have made traditional learning more social and personalized. Which of the following can be referred to as Web 2.0 tools?

- a. Blogs and wikis
- b. Podcasts and mashups
- c. Social networking communities
- d. All of the above

Answer: d

UNIT-9

PEOPLE & ENVIRONMENT INTERACTION

- Environment is the natural component in which biotic (living) and abiotic (nonliving) factors interact with each other. These interactions shape the habitat and ecosystem of an organism.
- In biological sense, environment constitutes the physical (nutrients, water, air etc.) and biological factors (biomolecules, organisms) along with their chemical interactions (chemical cycles – carbon cycle, nitrogen cycle etc.) that affect an organism or a group of organisms.
- All organisms are dependent on the environment to carry out their natural life processes (birth to death) and to meet their physical requirements (food, energy, water, oxygen, shelter etc.).
- The environment is not static. Both biotic and abiotic factors are in a constant flux and keep changing continuously.

Habitat

- Habitat is the physical environment in which an organism lives (it corresponds to address of an organism).
- It is an ecological or environmental area inhabited by **particular species** of plants, animals, fungi, etc. **Many habitats make up the environment.**
- A single habitat may be common for more than one organism which have similar requirements.
- For example, a single aquatic habitat may support a fish, frog, crab, phytoplankton and many other kinds of organisms.
- The various species sharing a habitat thus have the same 'address'. Forest, river etc. are other examples of habitat.

All habitats are environments but all environments are not habitats.

Biosphere

- The biosphere is the **biological component** (supporting life) of earth which includes the lithosphere, hydrosphere and atmosphere.
- The biosphere includes all living organisms on earth, together with the dead organic matter produced by them.
- Biosphere is absent at extremes of the North and South poles, the highest mountains and the deepest oceans, since existing hostile conditions there do not support life [Life is the characteristic feature of biosphere].
- Occasionally spores of fungi and bacteria do occur at great height beyond 8,000 meters, but they are metabolically inactive, and hence represent only dormant life.

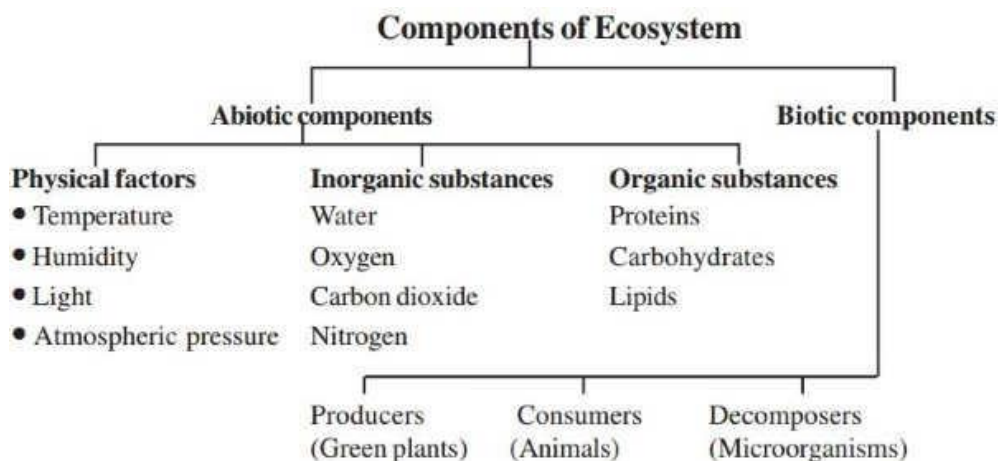
Ecosystem

- An ecosystem can be visualized as a **functional unit of nature**, where living organisms [**producers, consumers, and decomposers**] interact among themselves and also with the surrounding physical environment.
- Ecosystem varies greatly in size from a small pond to a large forest or a sea.
- Forest, grassland and desert are some examples of terrestrial ecosystems; pond, lake, wetland, river and estuary are some examples of aquatic ecosystems. Crop fields and an aquarium may also be considered as man-made ecosystems.
- In the ecosystem, biotic and abiotic components are linked together through **nutrient cycles** and **energy flows**.
- An ecosystem can be of any size but usually encompasses **specific and limited species**. Eg: Aquatic Ecosystem. [This is how ecosystem is different from Environment]

Everything that lives in an ecosystem is dependent on the other species and elements that are also part of that ecological community. If one part of an ecosystem is damaged or disappears, it has an impact on everything else

Components of an Ecosystem

- The components of the ecosystem are categorized into abiotic or non-living and biotic or living components. Both the components of ecosystem and environment are **same**.



Abiotic Components

- Abiotic components are the inorganic and non-living parts which act as major **limiting factors**.

Biotic Components

Primary producers - Autotrophs (self-nourishing)

- Primary producers are basically green plants, certain bacteria and algae that carry out photosynthesis.
- In terrestrial ecosystem, grasses, plants and trees are the primary producers while in aquatic ecosystem, microscopic algae [plankton] are the primary producers.

Consumers — Heterotrophs or Phagotrophs (other nourishing)

- Consumers are incapable of producing their own food. They depend on organic food derived from plants, animals or both.
- Consumers can be divided into two broad groups namely micro and macro consumers.

Macro consumers

- **Herbivores** are primary consumers which feed mainly on plants e.g. cow.
- Secondary consumers feed on primary consumers e.g. wolves, dogs, etc.
- **Carnivores** which feed on both primary and secondary consumers are called tertiary consumers e.g. lion which can eat wolves, snakes etc.
- **Omnivores** are organisms which consume both plants and animals e.g. man, bear, etc.

Micro consumers - Saprotrophs (decomposers or osmotrophs)

- They are bacteria and fungi which obtain energy and nutrients from dead organic substances (**detritus**) of plant and animals.
- The products of decomposition such as inorganic nutrients which are released in the ecosystem are reused by producers and thus recycled.
- Earthworm and certain soil organisms (such as nematodes, and arthropods) are detritus feeders and help in the decomposition of organic matter and are called **detritivores**.

Ecology

- The term ecology was derived from two Greek words 'Oikos' meaning home and 'logos' meaning study.
- Ecology is the branch of biology concerned with the relations of organisms to one another (energy flow and mineral cycling) and to their physical surroundings (environment).
- Ecology encompasses study of individual, organisms, population, community, ecosystem, biome and biosphere which form the various levels of **ecological organization**.
- The Indian texts of Vedas, the **Samhitas**, the **Brahmanas** and the **Aranyakas-Upanishads** contain many references to ecological concepts. The Indian treatise on medicine, the **Caraka-Samhita** and the surgical text **Susruta-Samhita**, show that people during this period had a good understanding of plant and animal ecology.

Levels of Organizations In Ecology

- Ecology not only deals with the study of the relationship of individual organisms with their environment, but also with the study of populations, communities, ecosystems, biomes, and biosphere as a whole.
- **Individual: Organism** is an individual living being that has the ability to act or function independently. It may be any organism.
- **Species: Species** are a group of living organisms consisting of similar individuals capable of exchanging genes or of **interbreeding**, considered as the basic unit of taxonomy and denoted by a Latin binomial, e.g. Homo sapiens.

- Population: Population is a community of interbreeding organisms [**same species**], occupying a defined area during a specific time.

Population growth rate is the percentage variation between the numbers of individuals in a population at two different times. It can be positive due to birth and/or immigration or negative due to death and/or emigration

Ecotone

- An ecotone is a **zone of junction** or a **transition area** between two biomes [diverse ecosystems]. It is where two communities meet and integrate.
- For e.g. the **mangrove forests** represent an ecotone between marine and terrestrial ecosystem. Other examples are **grassland** (between forest and desert), **estuary** (between fresh water and salt water) and river bank or marsh land (between dry and wet).

Ecological Niche

- Niche refers to the **unique functional role and position of a species** in its habitat or ecosystem.
- In nature, many species occupy the same habitat but they perform different functions.

Functions Of Ecosystem

- The function of an ecosystem include:
 1. **Ecological succession or ecosystem development**
 2. **Homeostasis (or cybernetic) or feedback control mechanisms**
 3. **Energy flow through food chain [Next Post]**

Ecological Succession

- Biotic communities are dynamic in nature and change over a period of time. The process by which communities of plant and animal species in an area are replaced or changed into another over a period of time is known as ecological succession.
- Succession is a universal process of directional change in vegetation, on an ecological time scale.
- Succession occurs when a series of communities replace one another due to large scale destruction (natural or manmade). This process continues with one community replacing another, until a stable, mature community develops.
- Succession is a progressive series of changes which leads to the establishment of a relatively **stable climax community**.
- The first plant to colonize an area is called the **pioneer community**. The final stage of succession is called the **climax community**. The stage leading to the climax community are called **successional stages** or **seres**. Each transitional (temporary) community that is formed and replaced during succession is called a stage in succession or a **seral community**.

- Succession is characterized by the following: increased productivity, the shift of nutrients from the reservoirs, increased diversity of organisms with increased niche development, and a gradual increase in the complexity of food webs.
- Succession would occur faster in area existing in the **middle of the large continent**. This is because, here seeds of plants belonging to the different seres would reach much faster, establish and ultimately result in climax community.
- The terminal (final) stage of succession forms the community which is called as **climax community**. A climax community is stable, mature, more complex and long lasting.
- The entire sequence of communities in a given area, succeeding each other, during the course of succession is termed **sere**. Succession that occurs on land where moisture content is low for e.g. on bare rock is known as **xerarch**. Succession that takes place in a water body, like ponds or lake is called **hydrarch**.

Primary Succession

- Primary succession takes place on over a **bare or unoccupied areas** such as rocks outcrop, newly formed deltas and sand dunes, emerging volcano islands and lava flows as well as glacial moraines (muddy area exposed by a retreating glacier) where no community has existed previously.

In primary succession on a terrestrial site the new site is first colonized by a few hardy pioneer species that are often microbes, lichens and mosses. The pioneers over a few generations alter the habitat conditions by their growth and development

Secondary Succession

- Secondary succession occurs when plants recognize an area in which the climax community has been disturbed.
- Secondary succession is the sequential development of biotic communities after the **complete or partial destruction of the existing community**.

Energy Flow through an Ecosystem – Trophic Levels

- The flow of energy from producer to top consumers is called energy flow which is **unidirectional**.
- To understand the energy flow through the ecosystem we need to study about the trophic levels [trophic level interaction].
- Trophic level is the representation of energy flow in an ecosystem. The trophic level of an organism is the position it occupies in a food chain.
- Trophic level interaction deals with how the members of an ecosystem are connected based on nutritional needs.
- Energy flows through the trophic levels from producers to subsequent trophic levels is unidirectional.
- Energy level **decreases** from the first trophic level upwards due to loss of energy in the form of heat at each trophic level.

- This energy loss at each trophic level is quite significant. Hence there are usually not more than four-five trophic levels [beyond this the energy available is negligible to support an organism].
- The trophic level interaction involves three concepts namely

1. **Food Chain**
2. **Food Web**
3. **Ecological Pyramids**

Food Chain

- Transfer of food energy from green plants (producers) through a series of organisms with repeated eating and being eaten link is called a food chain. E.g. Grasses → Grasshopper → Frog → Snake → Hawk/Eagle.
- Each step in the food chain is called trophic level. A food chain starts with producers and ends with top carnivores.
- The trophic level of an organism is the position it occupies in a food chain.

Types of Food Chains

1. Grazing food chain
2. Detritus food chain

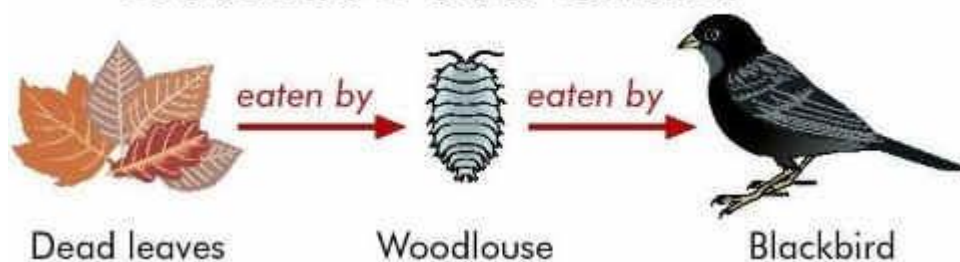
Grazing food chain

- The consumers which start the food chain, utilizing the plant or plant part as their food, constitute the grazing food chain. This food chain begins from green plants at the base and the primary consumer is herbivore.
- For example, In terrestrial ecosystem, grass is eaten by caterpillar, which is eaten by lizard and lizard is eaten by snake.
- In Aquatic ecosystem phytoplankton (primary producers) are eaten by zoo planktons which are eaten by fishes and fishes are eaten by pelicans.

Detritus food chain

- This type of food chain starts from dead organic matter of decaying animals and plant bodies.
- Dead organic matter or detritus feeding organisms are called **detritivores** or **decomposer**. The detritivores are eaten by predators.
- The two food chains are linked. The initial energy source for detritus food chain is the waste materials and dead organic matter from the grazing food chain.
- In an **aquatic ecosystem, grazing food chain** is the major conduit for energy flow. As against this, in a terrestrial ecosystem, a much larger fraction of energy flows through the detritus food chain than through the grazing food chain.

Detritus Food Chain



Food Web

- Multiple interlinked food chains make a food web. Food web represents all the possible paths of energy flow in an ecosystem.
- If any of the intermediate food chain is removed, the succeeding links of the chain will be affected largely.
- The food web provides more than one alternative for food to most of the organisms in an ecosystem and therefore increases their chance of survival.
- Also food availability and preferences of food of the organisms may shift seasonally e.g. we eat watermelon in summer and peaches in the winter. Thus there are interconnected networks of feeding relationships that take the form of food webs.

• Pollutants And Trophic Level – Biomagnification

- Pollutants, especially non-degradable ones move through the various trophic levels in an ecosystem. Non-degradable pollutants mean materials, which cannot be metabolized by the living organisms. Example: **Chlorinated Hydrocarbons**.
- **Chlorinated Hydrocarbons** or **Organochloride** or CHC are hydrocarbons whose some or most hydrogen atoms have been replaced by **chlorine** E.g. **DDT, endosulfan etc.**
- A variety of simple chlorinated hydrocarbons including **dichloromethane, chloroform**, and **carbon tetrachloride**.

Applications of CHC

- Production of vinyl chloride almost all of which was converted into polyvinylchloride (PVC) [PVC pipes].
- Chloroform, dichloromethane, dichloroethene, and trichloroethane are useful solvents. These solvents are immiscible with water and effective in cleaning applications such as degreasing and dry cleaning.
- Pesticides and insecticides such as DDT, heptachlor, and endosulfan are CHCs.

Effects of CHC

- Dioxins (highly toxic organic compound produced as a by-product in some manufacturing processes), produced when organic matter is burned in the presence of chlorine, and some insecticides, such as DDT, are persistent organic pollutants.

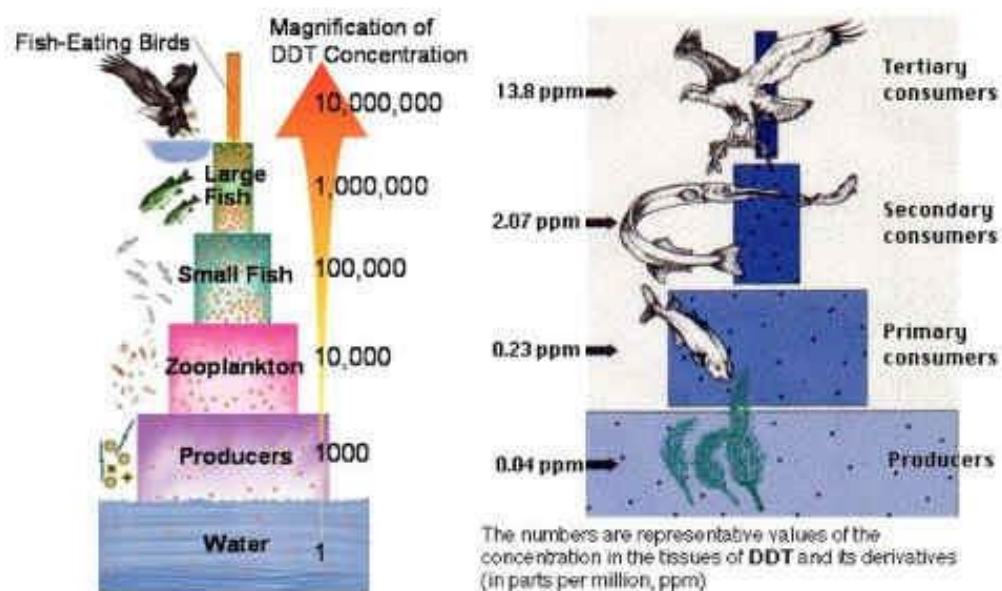
- DDT, which was widely used to control insects in the mid-20th century, accumulates in food chains, and causes reproductive problems (e.g., eggshell thinning) in certain bird species.
- DDT residues continue to be found in humans and mammals across the planet many years after production and use have been limited.
- In Arctic areas, particularly high levels are found in marine mammals. These chemicals concentrate in mammals, and are even found in human breast milk.
- In some species of marine mammals, particularly those that produce milk with a high fat content, males typically have far higher levels, as females reduce their concentration by transfer to their offspring through lactation.
- Endosulfan became a highly controversial agrichemical due to its acute toxicity, potential for bioaccumulation, and role as an **endocrine disruptor** (enhances the effect of estrogens causing reproductive and developmental damage in both animals and humans).
- Because of its threats to human health and the environment, a global ban on the manufacture and use of endosulfan was negotiated under the **Stockholm Convention** in April 2011.
- Movement of these pollutants involves two main processes:

1. **Bioaccumulation.**
2. **Biomagnification.**

Bioaccumulation

- It refers to how pollutants enter a food chain.
- In bioaccumulation there is an increase in concentration of a pollutant from the environment to the first organism in a food chain.

Biomagnification



- Bio-magnification refers to the tendency of pollutants to concentrate as they move from one trophic level to the next.

- Thus in biomagnification there is an increase in concentration of a pollutant from one link in a food chain to another.
- In order for biomagnification to occur, the pollutant must be: long-lived, mobile, soluble in fats, biologically active. E.g. DDT.
- If a pollutant is short-lived, it will be broken down before it can become dangerous.
- If it is not mobile, it will stay in one place and is unlikely to be taken up by organisms.
- If the pollutant is soluble in water, it will be excreted by the organism. Pollutants that **dissolve in fats**, however, may be retained for a long time.
- It is traditional to measure the amount of pollutants in fatty tissues of organisms such as fish.
- In mammals, we often test the milk produced by females, since the milk has a lot of fat in it and is often more susceptible to damage from toxins (poisons).

Nitrogen Cycle [Gaseous Cycle]

- Apart from carbon, hydrogen and oxygen, nitrogen is the most prevalent element in living organisms.
- Nitrogen is a constituent of **amino acids, proteins, hormones, chlorophylls** and many of the **vitamins**.
- Plants compete with microbes for the limited nitrogen that is available in soil. Thus, nitrogen is a **limiting nutrient** for both natural and agricultural ecosystems.
- Nitrogen exists as two nitrogen atoms (N_2) joined by a very strong **triple covalent bond** ($N \equiv N$).
- In nature, **lightning** and **ultraviolet radiation** provide enough energy to convert nitrogen to nitrogen oxides (NO , NO_2 , N_2O).
- Industrial combustions, forest fires, automobile exhausts and power-generating stations are also sources of atmospheric nitrogen oxides.
- **Eutrophication – Algal Bloom**
- Eutrophic water body: it is a body of water rich in nutrients and so supporting a dense plant population, the decomposition of which kills animal life by depriving it of oxygen.
- Eutrophication is the response to the addition of nutrients such as **nitrates** and **phosphates** naturally or artificially, fertilizing the aquatic ecosystem.
- **Algal blooms** are the consequence of **Eutrophication**.
- Eutrophication occurs naturally due to deposition of nutrients [such as in depositional environments] carried by flood waters. It takes over centuries for eutrophication to occur naturally.
- Similar nutrient enrichment of lakes at an accelerated rate is caused by human activities [discharge of wastewaters or agricultural runoff, Combustion of fossil fuel (produces gases — nitrogen oxides), growing urban population in the coastal areas] and the consequent phenomenon is known as '**cultural eutrophication**'. It takes only decades.
- Phytoplankton (algae and blue-green bacteria) thrive on the excess nutrients and their population explosion covers almost entire surface layer. This condition is known as **algal bloom**.
- Oxygen in aquatic ecosystem is replenished by photosynthetic aquatic plants. Algal Blooms restrict the penetration of sunlight resulting in **death of aquatic plants**, and hence restricts the replenishment of oxygen.
- The oxygen level is already depleted due to the population explosion of phytoplankton.

- **Phytoplankton** are **photosynthetic during day time** adding oxygen to aquatic ecosystem. But **during nights, they consume far more oxygen** as they respire aggressively. i.e. Algal blooms accentuate the rate of oxygen depletion as the population of phytoplankton is very high.
- The primary consumers like small fish are killed due to oxygen deprivation caused by algal blooms.
- Death of primary consumers adversely effects the food chain and leads to the destruction of higher life forms.
- Further, more **oxygen is taken up by microorganisms during the decomposition** process of dead algae, plants and fishes. Due to reduced oxygen level, the remaining fishes and other aquatic organisms also die. All this eventually leads to degradation of aquatic ecosystem.
- The new anaerobic conditions [absence of oxygen] created promote growth of bacteria such as **Clostridium botulinum** which produces **toxins** deadly to aquatic organisms, birds and mammals.

Millenium Development Goals (MDGs)

Millenium Development Goals (MDGs) are the product of the **Millennium Summit** of **September 2000**. At this summit world leaders adopted the **UN Millennium Declaration**, committing their nations to a new global partnership by adoption of **Millennium Declaration by the General Assembly of the United Nations**. This summit committed to reduce **extreme poverty** and setting out a series of time-bound targets, with a deadline of **2015**. These **"time bound targets"** are now known as the **Millenium Development Goals (MDGs)**. According to **United Nations MDG** are "quantified targets for addressing extreme poverty in its many dimensions-*income poverty, hunger, disease, lack of adequate shelter, and exclusion-while promoting gender equality, education, and environmental sustainability*. They are also basic human rights-the rights of each person on the planet to health, education, shelter, and security. The Millennium Development Goals (MDGs) have helped in bringing out a much needed focus and pressure on basic development issues, which in turn led the governments at national and sub national levels to do better planning and implement more intensive policies and programmes. MDG's have played a big role in improving the social indicators in India. India has achieved the target of reducing countries poverty levels by **fifty percent by Dec, 2015**.

The MDGs consists of eight goals, all these goals target various developmental and human rights issues. The eight (8) Goals are as under:

- ❖ **Goal 1: eradicate extreme poverty and hunger;**
- ❖ **Goal 2: achieve universal primary education;**
- ❖ **Goal 3: promote gender equality and empower women;**
- ❖ **Goal 4: reduce child mortality;**
- ❖ **Goal 5: improve maternal health;**
- ❖ **Goal 6: combat HIV/AIDS, malaria, and other diseases;**
- ❖ **Goal 7: ensure environmental sustainability;**
- ❖ **Goal 8: develop a global partnership for development.**

Key points

- ❖ The number of people now living in extreme poverty has declined by more than half, falling from **1.9 billion in 1990** to **836 million in 2015**.
- ❖ The number of people in the working middle class—living on more than \$4 a day—nearly tripled between 1991 and 2015.
- ❖ The proportion of undernourished people in the developing regions dropped by almost half **since 1990**.
- ❖ The number of out-of-school children of primary school age worldwide fell by almost half, to an estimated **57 million in 2015**, down from 100 million in 2000.
- ❖ Gender parity in primary school has been achieved in the majority of countries.
- ❖ The mortality rate of children under-five was cut by more than half since 1990.
- ❖ **Since 1990**, maternal mortality fell by 45 percent worldwide.
- ❖ Over 6.2 million malaria deaths have been averted between 2000 and 2015.
- ❖ New HIV infections fell by approximately 40 percent between 2000 and 2013.
- ❖ By June 2014, 13.6 million people living with HIV were receiving antiretroviral therapy (ART) globally, an immense increase from just 800,000 in 2003.
- ❖ **Between 2000 and 2013**, tuberculosis prevention, diagnosis and treatment interventions saved an estimated 37 million lives.
- ❖ Worldwide 2.1 billion people have gained access to improved sanitation.
- ❖ Globally, **147 countries** have met the MDG drinking water target, 95 countries have met the MDG sanitation target and 77 countries have met both.
- ❖ Official development assistance from developed countries increased 66 percent in real terms from **2000 and 2014**, reaching \$135.2 billion.

Sustainable Development Goals

The Sustainable Development Goals are a set of **17 universal goals** that United Nations members states had adopted to frame the global development agenda for the next **15 years**.

What are the proposed 17 goals?

- 1) **End poverty** in all its forms everywhere
- 2) **End hunger**, achieve food security and improved nutrition, and promote sustainable agriculture.
- 3) **Ensure healthy** lives and promote wellbeing for all at all ages.
- 4) Ensure inclusive and equitable **quality education** and promote lifelong learning opportunities for all.
- 5) Achieve gender equality and empower all **women and girls**.
- 6) Ensure availability and **sustainable management** of **water and sanitation** for all.
- 7) Ensure access to affordable, reliable, sustainable and modern energy for all.
- 8) Promote **sustained**, inclusive and **sustainable economic growth**, full and productive employment, and decent work for all.
- 9) Build resilient infrastructure, promote inclusive and sustainable industrialization, and foster innovation.
- 10) **Reduce inequality** within and among countries.
- 11) Make cities and human settlements inclusive, safe, resilient and sustainable.
- 12) Ensure sustainable consumption and production patterns.

- 13) Take urgent action to combat climate change and its impacts (taking note of agreements made by the **UNFCCC forum**)
- 14) Conserve and sustainably use the oceans, seas and marine resources for sustainable development.
- 15) Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification and halt and reverse land degradation, and halt biodiversity loss.
- 16) Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels.
- 17) Strengthen the means of implementation and revitalize the global partnership for sustainable development.

On **September 25, 2015**, the world leaders gathered at the **United Nations Headquarters in New York** and adopted an outcome document which marked the culmination of the negotiations on sustainable development called '**Transforming our World: The 2030 Agenda for Sustainable Development**'.

This is a truly universal and transformative global development agenda for the next **15 years** that aims to guide the international community and national governments on a pathway towards sustainable development, taking everyone on board.

- ❖ The Outcome document contains **17 Sustainable Development Goals (SDGs)** and **169 targets**, as well as a section on means of implementation and renewed global partnership, and a framework for review and follow-up.
- ❖ This historic agenda calls upon countries at all development stages -poor, rich and middle-income -to join the efforts in realizing economic growth, social inclusion, environmental protection, all underpinned by good governance.
- ❖ The '**five Ps**'--**people, planet, prosperity, peace, and partnership**--encapsulates the broad scope of the agenda.
- ❖ The **SDGs** strengthens all the three dimensions of sustainable development- economic, social and environmental.
- ❖ **SDGs would replace the Millennium Development Goals (MDGs) that were in place from 2000 to 2015.**
- ❖ **Adopted in 2000**, the MDGs had eight key targets like eradication of poverty and hunger, universal primary education, gender equality, child mortality, maternal health, combat HIV/AIDS, malaria and other diseases, environment sustainability and to develop a global partnership for development.
- ❖ Some of the targets have already been met, such as halving the number of people living in extreme poverty. Despite the progress, the indignity of poverty has not ended for all.
- ❖ The new **SDGs** are expected to go a step ahead, address the root causes of poverty and other sustainable development agenda and areas which could not be completed earlier.
- ❖ This process emanated from one of the main outcomes of the **United Nations Conference on Sustainable Development (Rio+20)**, held in **Rio de Janeiro** in June 2012.
- ❖ The **UN General Assembly (UNGA)** constituted a **30 member Open Working Group (OWG)** in **January, 2013** for preparing a proposal on the SDGs. The OWG submitted its final report to the UNGA.

- ❖ The agenda highlights poverty eradication as the overarching goal and has at its core the integration of the economic, social and environmental dimensions of sustainable development.
- ❖ This also calls for an **invigorated, global partnership for sustainable development**, including for multi-stakeholder partnerships, in addition to enhancing capacities of stake holders in better quality measurement and compilation of data or information on sustainable development.
- ❖ One of the core elements of the outcome document was an effective follow-up and review architecture which is crucial to support the implementation of the new agenda.
- ❖ The High Level Political Forum on sustainable development, set up after the **Rio+20 Conference**, will be the apex forum for follow up and review while the General Assembly, the Economic and Social Council and specialized agencies will also be reviewing specific areas.

ANTHROPOGENIC ACTIVITIES

A simple 'translation' of **anthropogenic** is "**human caused**", or "**caused by human activity**".

Anthropogenic can be used to describe anything that is "**human caused**", but it's used most frequently in reference to contemporary (present day) **climate change**, which is interpreted to be primarily anthropogenic in origin, based on a large body of reliable scientific research. This is in contrast to natural **climate change**, which might be caused by a variety of naturally occurring processes, such as variations in the brightness of the sun, changes in ocean currents that persist for many years, and others.

The primary driver of contemporary climate change is **warming of the atmosphere by anthropogenic greenhouse gases (AGHGs)**, especially **CO₂** that has been added to the atmosphere as a consequence of **human activity**... particularly through the combustion of **fossil fuels (coal, oil, & natural gas)**. That's why contemporary climate change is often referred to as **Anthropogenic Global Warming**, or **AGW**. Some people use the abbreviation **ACC**.

Human impact on the environment or anthropogenic impact on the environment includes changes to **biophysical environments and ecosystems, biodiversity**, and **natural resources** caused directly or indirectly by humans, including global warming, environmental degradation (**such as ocean acidification**), **mass extinction** and **biodiversity loss**, **ecological crisis**, and **ecological collapse**. Modifying the environment to fit the needs of society is causing severe effects, which become worse as the problem of human overpopulation continues. Some human activities that cause damage (**either directly or indirectly**) to the environment on a global scale include human reproduction, **overconsumption**, **overexploitation**, pollution, and deforestation, to name but a few. Some of the problems, including **global warming** and biodiversity loss pose an existential risk to the human race, and overpopulation causes those problems.

The term **anthropogenic** designates an effect or object resulting from human activity. The term was first used in the technical sense by **Russian geologist Alexey Pavlov**, and it was first used in **English by British ecologist Arthur Tansley** in reference to human influences on climax plant communities. The atmospheric **scientist Paul Crutzen introduced the term "Anthropocene"** in the mid-**1970s**. The term is sometimes used in the context of **pollution emissions** that are produced from human activity but also applies broadly to all major human impacts on the environment.

Pollution

- Pollution may be defined as addition of undesirable material into the environment as a result of human activities. The agents which cause environmental pollution are called pollutants.
- A pollutant may be defined as a physical, chemical or biological substance released into the environment which is directly or indirectly harmful to humans and other living organisms.
- **Pollution may be of the following types: Air pollution, Noise pollution, Water pollution, Soil pollution, Thermal pollution and Radiation pollution.**
- In order to control environmental pollution, the Government of India has passed the **Environment (Protection) Act, 1986** to protect and improve the quality of our environment (air, water and soil).

Air Pollution

- Air pollution may be defined as the presence of any solid, liquid or gaseous substance including **noise** and **radioactive radiation** in the atmosphere in such concentration that may be directly and/or indirectly injurious to humans or other living organisms, property or interferes with the normal environmental processes.
- An ever increasing use of fossil fuels in power plants, industries, transportation, mining, construction of buildings, stone quarries had led to air pollution.
- Fossil fuels contain small amounts of **nitrogen** and **sulphur**. Burning of fossil fuels like coal (thermal power plants) and petroleum (petroleum refineries) release different **oxides of nitrogen and sulphur** into the atmosphere.
- These gases react with the water vapor present in the atmosphere to form sulphuric acid and nitric acid. The acids drop down with rain, making the rain acidic. This is called **acid rain**.
- Acid rain corrodes the marble monuments like Taj-Mahal. This phenomenon is called as "**Marble cancer**".
- Other kinds of pollutants are **chlorofluorocarbons (CFCs)** which are used in **refrigerators, air conditioners and as pressurizing agents in aerosol sprays**. CFCs damage the ozone layer of the atmosphere.
- The combustion of fossil fuels also increases the amount of suspended particles in air. These suspended particles could be unburnt carbon particles or substances called hydrocarbons.
- Presence of high levels of all these pollutants cause visibility to be lowered, especially in cold weather when water also condenses out of air. This is known as **smog** and is a visible indication of air pollution.

Classification of Pollutants

According to the form in which they persist after release into the environment.

- **Primary pollutants:** These persist in the form in which they are added to the environment e.g. DDT, plastic.
- **Secondary Pollutants:** These are formed by interaction among the primary pollutants. For example, **peroxyacetyl nitrate (PAN)** is formed by the interaction of **nitrogen oxides** and **hydrocarbons**.

According to their existence in nature

- **Quantitative Pollutants:** These occur in nature and become pollutant when their concentration reaches beyond a threshold level. E.g. carbon dioxide, nitrogen oxide.
- **Qualitative Pollutants:** These do not occur in nature and are man-made. E.g. fungicides, herbicides, DDT etc.

Particulate pollutants

- **Particulate matter** suspended in air are dust and soot released from the industrial chimneys. Their size ranges from **0.001 to 500 micrometers (μm) in diameter**.
- Particles less than **10 μm** float and move freely with the air current. Particles which are more than **10 μm** in diameter settle down. **Particles less than 0.02 μm** form persistent **aerosols**.
- Major source of **SPM (suspended particulate matter)** are vehicles, power plants, construction activities, oil refinery, railway yard, market place, industries, etc.
- According to **Central Pollution Control Board (CPCB)**, particulate size **2.5 μm** or less in diameter (**PM 2.5**) are responsible for causing the greatest harm to human health.
- These fine particulates can be inhaled deep into the lungs and can cause breathing and respiratory symptoms, irritation, inflammations and **pneumoconiosis** – a disease of the lungs due to inhalation of dust, characterized by inflammation, coughing, and fibrosis..

Fly ash

- **Fly ash** is ejected mostly by thermal power plants as byproducts of coal burning operations.
- **Fly ash** pollutes air and water and may cause heavy metal pollution in water bodies.
- Fly ash affects vegetation as a result of its direct deposition on leaf surfaces or indirectly through its deposition on soil.
- Fly ash in the air slowly settles on leaves and crops in fields in areas near to thermal power plants and lowers the plant yield.
- Fly ash is now being used for making **bricks** and as a **land fill**

Composition

- Fly ash particles are oxide rich and consist of silica, alumina, oxides of iron, calcium, and magnesium and toxic heavy metals like **lead, arsenic, cobalt, and copper**.
- Major oxides are present are **Aluminium silicate** (in large amounts), **silicon dioxide (SiO_2)** and **calcium oxide (CaO)**.

Advantages

- Cement can be replaced by fly ash up to 35%, thus reducing the cost of construction, making roads, etc.
- Fly ash bricks are light in weight and offer high strength and durability.
- Fly ash is a better fill material for road embankments and in concrete roads.
- Fly ash can be used in **reclamation of wastelands**.
- Abandoned mines can be filled up with fly ash.

- Fly ash can increase the crop yield and it also enhances water holding capacity of the land

Policy measures of MoEF

- The Ministry of Environment and Forests has made it mandatory to use Fly Ash based products in all construction projects, road embankment works and low lying land filling works within 100 kms radius of Thermal Power Station and mine filling activities within 50 kms radius of Thermal Power Station.

Lead

- It is present in petrol, diesel, lead batteries, paints, hair dye products, etc.
- It can cause **nervous system damage** and digestive problems and, in some cases, cause cancer. Lead affects children in particular.
- **Tetraethyl lead (TEL)** is used as an **anti-knock agent** in petrol for smooth and easy running of vehicles.
- The lead particles coming out from the exhaust pipes of vehicles is mixed with air. If inhaled it produces injurious effects on **kidney and liver** and interferes with development of **red blood cells**.
- Lead mixed with water and food can create cumulative poisoning. It has long term effects on children as it **lowers intelligence**.

Metallic Oxides

- Oxides of iron, aluminum, manganese, magnesium, zinc and other metals have adverse effect due to deposition of dust on plants during mining operations and metallurgical processes.
- They create physiological, biochemical and developmental disorders in plants and also contribute towards **reproductive failure in plants**.

Nanoparticles – NPs

- **Nanoparticles are particle** with dimensions comparable to **1/10⁹ of** a meter [1 divided by 100 crores].
- Major natural processes that release NPs in the atmosphere are forest fires, volcanic eruptions, weathering, dust storms from desert etc.
- Naturally occurring **NPs** are quite heterogeneous in size and can be transported over thousands of kilometres and remain suspended in the air for several days.
- Nanotechnology has a global socioeconomic value, with applications ranging from electronics to biomedical uses (delivering drugs to target sites).
- Man-made **NPs** are unknowingly or purposely released in the environment during various industrial and mechanical processes.

Effects of Nano-particles on the environment

- After release in the environment, **NPs** will accumulate in various environmental matrices such as air, water, soil and sediments including wastewater sludge.

- **NPs** in the environment influences dust cloud formation, environmental hydroxyl radical concentration, **ozone depletion**, or **stratospheric** temperature change.

Effect of NNPs on dust cloud formation

- NNPs are thought to play an important role in dust-clouds formation after being released into the environment as they coagulate and form dust cloud.
- Dust cloud formation decreases sun light intensity.

Asian brown clouds impact on Himalayan glaciers

- **Asian brown clouds** carry large amounts of soot and **black carbon** (NPs) which are deposited on the glaciers.
- This could lead to higher absorption of the sun's heat and potentially contributing to the increased melting of glaciers.

NPs and ozone depletion

- The **nanoparticles** have greater **chemical reactivity**. They can result in increased production of reactive oxygen species (ROS), including free radicals like Cl^\cdot .
- **Radicals like Cl^\cdot destroy ozone.**

In chemistry, a radical (a free radical) is an atom, molecule, or ion that has unpaired valence electrons.

Major Gaseous Air Pollutants, Their Sources & Effects

Carbon monoxide (CO)

- **Carbon monoxide (CO)** is a colorless, odorless, tasteless and highly toxic gas that is slightly less dense than air. It is **short-lived** (stay only few months) in the atmosphere.
- **Carbon monoxide** is produced from the exhaust of internal combustion engines and from incomplete combustion of various other fuels. Iron smelting also produce carbon monoxide as a byproduct.
- It forms when there is not enough oxygen to produce **carbon dioxide (CO₂)**.
- In the presence of oxygen, carbon monoxide burns with a blue flame, producing carbon dioxide.
- Worldwide, the largest source of carbon monoxide is natural in origin, due to photochemical reactions in the troposphere.
- Other natural sources of CO include volcanoes, forest fires, and other forms of combustion.

Health Effects

- Carbon monoxide poisoning is the most common type of fatal air poisoning.
- It is toxic to hemoglobin animals (including humans) when encountered in concentrations above about 35 ppm.

- It is also produced in normal animal metabolism in low quantities.
- It combines with hemoglobin to produce **carboxyhemoglobin**, which usurps the space in hemoglobin that normally carries oxygen.

Environmental Effects

- In the atmosphere, it is spatially variable and short lived, having a role in the formation of **ground-level ozone (tropospheric ozone)** and can elevate concentrations of **methane**.
- Carbon monoxide reacts with hydroxyl radical (-OH) to produce peroxy radical. Peroxy radical reacts with nitrogen oxide (NO) to form **nitrogen dioxide (NO₂)** and hydroxyl radical. **NO₂ gives O₃ via photolysis** (separation of molecules by the action of light).

Carbon dioxide (CO₂)

- Colorless and odorless gas vital to life on Earth. It is heavier than air.
- Natural sources include volcanoes, hot springs and geysers, and it is freed from carbonate rocks by dissolution in water and acids.
- Because carbon dioxide is soluble in water, it occurs naturally in groundwater, rivers and lakes, in ice caps and glaciers and also in seawater.

Effects on Health

- CO₂ is an **asphyxiant gas** (asphyxia → a condition arising when the body is deprived of oxygen, causing unconsciousness or death.).
- Concentrations of 7% may cause suffocation, even in the presence of sufficient oxygen, manifesting as dizziness, headache, and unconsciousness.

Effects on Environment

- Carbon dioxide is an important greenhouse gas. Burning of carbon-based fuels since the industrial revolution has led to **global warming**.
- It is also a major cause of **ocean acidification** because it dissolves in water to form **carbonic acid**.

Chlorofluorocarbons (CFCs)

- Chlorofluorocarbons (CFCs) are used in refrigerators, air conditioners and aerosol sprays.
- Since the late **1970s**, the use of CFCs has been heavily regulated because of their destructive effects on the ozone layer. (Explained in a separate post on Ozone Depletion)
- The **Montreal Protocol** on Substances that Deplete the Ozone Layer (a protocol to the **Vienna Convention for the Protection of the Ozone Layer**) is an **international treaty** designed to protect the ozone layer by phasing out the production of numerous substances including CFCs which are responsible for ozone depletion.

Ozone (O₃)

- It occurs naturally in the stratosphere. Here it absorbs harmful ultraviolet rays of the sun.
- However, at the ground level, it is a pollutant (**Greenhouse gas**) with highly toxic effects.
- Vehicles and industries are the major source of ground-level ozone emissions.
- **Carbon monoxide, Nitrogen dioxide** play a major role in converting O₂ to O₃.
- Ozone makes our eyes itchy, and watery. It lowers our resistance to cold and pneumonia.

Nitrogen oxide (NO_x)

- NO_x is a generic term for the various nitrogen oxides produced during combustion.
- They are produced mainly in **internal combustion engines** and **coal burning power plants**. They are produced naturally by **lightening**.

[Oxygen and nitrogen do not react at ambient temperatures. But at high temperatures they produce various oxides of nitrogen. Such temperatures arise inside an internal combustion engine or a power station boiler]

- **Agricultural fertilization** and the **use of nitrogen fixing plants** also contribute to atmospheric NO_x, by promoting nitrogen fixation by microorganisms.
- **NO_x (contributes to global cooling)** should not be confused with **nitrous oxide (N₂O)**, which is a **greenhouse gas** and has many uses as an oxidizer.

Effects on Health and Environment

- They are believed to aggravate **asthmatic conditions** and create many respiratory health issues, especially in children.
- The reduction of NO_x emissions is one of the most important technical challenges facing **biodiesel**.
- NO_x gases react to form **smog** and **acid rain** as well as being central to the formation of **tropospheric ozone**.
- When NO_x and volatile organic compounds (VOCs) react in the presence of sunlight, they form **photochemical smog**.
- Mono-nitrogen oxides eventually form nitric acid when dissolved in atmospheric moisture, forming a component of acid rain.
- NO_x emissions cause **global cooling** through the formation of -OH radicals that **destroy methane molecules**, countering the effect of greenhouse gases.

Sulphur dioxide (SO₂)

- It is a toxic gas with a pungent, irritating smell. It contributes to **acid rain**
- It is released naturally by volcanic activity. It is abundantly available in the atmosphere of **Venus**.
- Sulfur dioxide is primarily produced for sulfuric acid manufacture.
- Inhaling sulfur dioxide is associated with increased respiratory symptoms and disease, difficulty in breathing, and premature death. It also weakens the functioning of certain nerves.

It is also produced by

- **Burning coal in thermal power plants and diesel fuels.**
- Some industrial processes, such as production of paper and smelting of metals.
- Reactions involving **Hydrogen Sulphide (H₂S)** and oxygen.
- The roasting of sulfide ores such as pyrite, sphalerite, and cinnabar (mercury sulfide).

Pollutants

Volatile organic compounds (VOCs)

- Volatile Organic Compounds (VOCs) are a large group of **carbon-based** chemicals that easily **evaporate** at room temperature.
- For example, **formaldehyde**, which evaporates from paint, has a boiling point of only –19 °C. Formaldehyde causes irritation to the eyes and nose and allergies.
- The main indoor sources are perfumes, hair sprays, furniture polish, glues, air fresheners, moth repellents, wood preservatives, and other products.
- Health effect - irritation of the eye, nose and throat, headaches, nausea and loss of coordination.
- Long term - suspected to damage the liver and other parts of the body.

Benzene and Ethylene

- Benzene is a natural constituent of crude oil and is one of the elementary petrochemicals.
- Because benzene has a **high octane number**, it is an important component of gasoline.
- Benzene increases the **risk of cancer** and other illnesses. Benzene is a notorious cause of **bone marrow failure**.
- Ethylene is widely used in the chemical industry. Much of this production goes toward **polyethylene**, a widely used plastic containing polymer chains of ethylene units in various chain lengths.
- Ethylene is also an important **natural plant hormone**, used in agriculture to force the **ripening of fruits**.
- Ethylene is of low toxicity to humans and exposure to excess ethylene cause adverse health effects like headache, drowsiness, dizziness and unconsciousness.
- Ethylene is not but **Ethylene oxide is a carcinogen**.

Tobacco Smoke

- Tobacco smoke generates a wide range of harmful chemicals and is **carcinogenic** (cancer causing).
- Health effect - burning eyes, nose, and throat irritation to cancer, bronchitis, severe asthma, and a decrease in lung function.

Biological pollutants

- It includes pollen from plants, mite, and hair from pets, fungi, parasites, and some bacteria.
- Most of them are allergens and can cause asthma, hay fever, and other allergic diseases.

Asbestos

- Asbestos refers to a set of six naturally occurring silicate **fibrous minerals** — chrysotile, crocidolite, amosite, anthophyllite, tremolite, and actinolite.
- It is now known that prolonged inhalation of asbestos fibers can cause serious and fatal illnesses including **lung cancer**, **mesothelioma**, and **asbestosis** (a type of pneumoconiosis).

Radon

- It is a gas that is emitted naturally by the **soil**. Due to modern houses having poor ventilation, it is confined inside the house and causes lung cancers.

Smog - Photochemical smog – Sulfurous smog

Prevention and Control of air Pollution

Indoor Air Pollution

- Poor ventilation due to faulty design of buildings leads to pollution of the confined space.
- Paints, carpets, furniture, etc. in rooms may give out volatile organic compounds (VOCs).
- Use of disinfectants, fumigants, etc. may release hazardous gases.
- In hospitals, pathogens present in waste remain in the air in the form of spores. This can result in hospital acquired infections and is an occupational health hazard.
- In congested areas, slums and rural areas burning of firewood and biomass results in lot of smoke.
- Children and ladies exposed to smoke may suffer from acute respiratory problems.

Prevention and control of indoor air pollution

- Use of wood and dung cakes should be replaced by cleaner fuels such as biogas, kerosene, LPG or electricity. But supply of electricity is limited. Similarly kerosene is also limited. The use of solar cookers must be encouraged.
- Old stoves must be replaced with improved stoves with high thermal efficiency and reduced emission of pollutants including smoke.
- The house designs should incorporate a well-ventilated kitchen.
- Those species of trees such as baval (Acacia nilotica) which are least smoky should be planted and used. Charcoal is a comparatively cleaner fuel.
- Indoor pollution due to decay of exposed kitchen waste can be reduced by covering the waste properly.
- Segregation of waste, pretreatment at source, sterilization of rooms will help in checking indoor air pollution.

Control of Industrial Pollution

- **Industrial pollution can be greatly reduced by:**

1. Use of cleaner fuels such as liquefied natural gas (LNG) in power plants, fertilizer plants etc. which is cheaper in addition to being environmentally friendly.
 2. Employing environment friendly industrial processes so that emission of pollutants and hazardous waste is minimized.
 3. Installing devices which reduce release of pollutants.
- Devices like filters, electrostatic precipitators, inertial collectors, scrubbers, gravel bed filters or dry scrubbers are described below:

Filters

- Filters remove particulate matter from the gas stream. The medium of a filter may be made of fibrous materials like cloth, granular material like sand, a rigid material like screen, or any mat like felt pad.
- **Baghouse filtration** system is the most common one and is made of cotton or synthetic fibres (for low temperatures) or glass cloth fabrics (for higher temperature up to 290°C).

Scrubbers

- Scrubbers are wet collectors. They remove **aerosols** from a stream of gas either by collecting wet particles on a surface followed by their removal, or else the particles are wetted by a scrubbing liquid.
- The particles get trapped as they travel from supporting gaseous medium across the interface to the liquid scrubbing medium. (this is just like mucus in trachea trapping dust)
- A scrubber can remove gases like **sulphur dioxide**.

Catalytic converter

- Proper maintenance of automobiles along with use of lead-free petrol or diesel can reduce the pollutants they emit.
- Catalytic converters, having expensive metals namely **platinum-palladium** and **rhodium** as the catalysts, are fitted into automobiles for reducing emission of poisonous gases.
- As the exhaust passes through the catalytic converter, unburnt hydrocarbons are converted into carbon dioxide and water, and carbon monoxide and nitric oxide are changed to carbon dioxide and nitrogen gas, respectively.
- Motor vehicles equipped with catalytic converter should use **unleaded petrol** because lead in the petrol inactivates the catalyst.

Apart from the use of above mentioned devices, other control measures are -

- Increasing the height of chimneys.
- Closing industries which pollute the environment.
- Shifting of polluting industries away from cities and heavily populated areas.
- Development and maintenance of green belt of adequate width.

Government Initiative

National Air Quality Monitoring Programme

- **Central Pollution Control Board (CPCB)** has been executing a nationwide programme of ambient air quality monitoring known as **National Air Quality Monitoring Programme (NAMP)**.

The National Air Quality Monitoring Programme (NAMP) is undertaken:

- to determine status and trends of ambient air quality;
- to ascertain the compliance of NAAQS;
- to identify non-attainment cities;
- to understand the natural process of cleaning in the atmosphere; and
- to undertake preventive and corrective measures.

National Ambient Air Quality Standards (NAAQS)

- The **NAAQS** have been revisited and revised in **November 2009 for 12 pollutants**, which include
 - sulphur dioxide (SO₂),
 - nitrogen dioxide (NO₂),
 - particulate matter having micron (PM₁₀),
 - particulate matter having size less than 2.5 micron (PM_{2.5}),
 - ozone,
 - lead,
 - carbon monoxide (CO),
 - arsenic,
 - nickel,
 - benzene,
 - ammonia, and
 - benzopyrene.

National Air Quality Index (AQI)

- Launched by the **Environment Ministry** in **April 2015**.
- Initiative under '**Swachh Bharat**'.

AQI

- It helps the common man to judge the air quality within his vicinity.
- Index constituted as a part of Government's mission to improve the culture of cleanliness.

Why is AQI necessary

- Quality of data from some cities remains weak and the standards set for pollutants fall short of World Health Organization recommendations.
- The pollution related analysis using vast number of complex parameters was complicated for the common man to understand.

Categories of air pollution under AQI

- There are six AQI categories, namely Good, Satisfactory, Moderately polluted, Poor, Very Poor, and Severe.

Pollutants considered

- The proposed **AQI will consider eight pollutants (PM10, PM2.5, NO2, SO2, CO, O3, NH3, and Pb).**

Alternatives

- Government is disincentivising use of private vehicles through **congestion charging**.
- The National Green Tribunal has ordered that diesel vehicles over 10 years old not ply on Delhi roads.
- Odd even formula.
- Making city roads friendly to bicycle users.
- Promoting rooftop solar power as an alternative to coal power.

Photochemical smog - Sulfurous smog

In this Post: Smog - Primary and secondary pollutants; Types of Smog: Sulfurous smog [London Smog] and Photochemical smog [Los Angeles Smog]; Effects of Smog; Question UPSC Mains 2015: Mumbai, Delhi and Kolkata are the three mega cities of the country but the air pollution is much more serious problem in Delhi as compared to the other two. Why is this so?] [200 words]

Smog

- Smog = **smoke + fog (smoky fog)** caused by the burning of large amounts of **coal, vehicular emission** and **industrial fumes** (Primary pollutants).
- Smog contains soot particulates like **smoke, sulphur dioxide, nitrogen dioxide** and other components.
- At least two distinct types of smog are recognized: **sulfurous smog and photochemical smog**.
- **Aerosols: they are stable suspensions of solid or liquid particles in air. Aerosols affect the weather conditions by blocking solar radiations. Aerosols consisting of liquid droplets called mist & aerosols contains of hot solid particles called dust.**

Primary and secondary pollutants

- A primary pollutant is an air pollutant emitted directly from a source.
- A secondary pollutant is not directly emitted as such, but forms when other pollutants (primary pollutants) react in the atmosphere.
- Examples of a secondary pollutant include **ozone**, which is formed when
 1. hydrocarbons (HC) and nitrogen oxides (NOx) combine in the presence of sunlight;
 2. NO combines with oxygen in the air; and

- acid rain, which is formed when sulfur dioxide or nitrogen oxides react with water.

Sulfurous smog

- Sulfurous smog is also called “**London smog**,” (first formed in London).
- Sulfurous smog results from a high concentration of **SULFUR OXIDES** in the air and is caused by the use of **sulfur-bearing fossil fuels, particularly coal** (Coal was the main source of power in London during nineteenth century. The effects of coal burning were observed in early twentieth century).
- This type of smog is aggravated by **dampness** and a **high concentration of suspended particulate matter** in the air.

Photochemical smog

- Photochemical smog is **also known** as “**Los Angeles smog**”.
- Photochemical smog occurs most prominently in urban areas that have large numbers of automobiles (**Nitrogen oxides** are the primary emissions).
- Photochemical (**summer smog**) forms when pollutants such as **nitrogen oxides** (primary pollutant) and **organic compounds** (primary pollutants) react together in the presence of **SUNLIGHT**. A gas called **OZONE** (Secondary pollutant) is formed.

Nitrogen Dioxide + Sunlight + Hydrocarbons = Ozone (Ozone in stratosphere it is beneficial, but near the earth's surface it results in global warming as it is a greenhouse gas)

- The resulting smog causes a light brownish coloration of the atmosphere, reduced visibility, plant damage, irritation of the eyes, and respiratory distress.

HAZE

- Haze is traditionally an atmospheric phenomenon where dust, smoke and other dry particles obscure the clarity of the sky (No condensation. Smog is similar to haze but there is condensation in smog).
- Sources for haze particles include farming (ploughing in dry weather), traffic, industry, and wildfires.

Effects of Smog

- The **atmospheric pollution** levels of Los Angeles, Beijing, Delhi, Mexico City and other cities are increased by **inversion** that traps pollution close to the ground.

Temperature Inversion – Types – Effects on Weather

- It is usually highly toxic to humans and can cause severe sickness, shortened life or death.
- Smog is a combination of airborne particulate matter, like soot, and invisible toxic gases including **ozone (O3)**, **carbon monoxide (CO)**, **sulfur dioxide (SO2)**, which are **carcinogens (cancer causing agents)**.

- Temperature inversions are accentuated and **precipitation is reduced**.

Smog related Haze lowers visibility.

Ozone Depletion | Ozone Hole - Causes, Effects

A layer of ozone present in the atmosphere (stratosphere) protects the biosphere from the harmful effects of UV radiation by absorbing them.

Ozone depletion or ozone hole refers to the damage suffered by the ozone layer due to natural and anthropogenic causes.

Each of the factors/causes responsible for ozone depletion are explained below.

Ozone Hole – Ozone Depletion

- Polar vortex and ozone depletion are two distinct but related phenomena.
- Ozone gas is continuously formed by the action of UV rays on molecular oxygen in the stratosphere. Also, ozone is simultaneously degraded into molecular oxygen in the stratosphere.
- There should be a balance between production and degradation of ozone in the stratosphere so that there is a continuous layer of ozone.
- Of late, the balance has been disrupted due to enhancement of ozone degradation by chlorofluorocarbons (CFCs) [chlorofluorocarbons (CFCs) are **halocarbons**]. There is a steady decline of about **4%** in the total volume of ozone in Earth's stratosphere.
- Much larger decrease in stratospheric ozone is observed around **Earth's polar regions**.

Halocarbon == a compound in which the hydrogen of a hydrocarbon is replaced by halogens like chlorine, bromine, iodine etc.

Halogen == group of reactive non-metallic elements like fluorine, chlorine, bromine, iodine, and astatine.

The thickness of the ozone in a column of air from the ground to the top of the atmosphere is measured in terms of **Dobson units (DU)**.

The ozone measurement instruments and techniques are varied. Some of them are the **Dobson spectrophotometer** and the **filter ozonometer** called M83.

Halogen atoms like chlorine destroy ozone

- **Photodissociation** (under the influence of sunlight) of **ozone-depleting substances (ODS)** like
 1. halocarbon refrigerants (CFCs),
 2. halocarbon solvents (Methyl Chloroform, carbon tetrachloride),
 3. propellants, and foam-blowing agents (CFCs, HCFCs, carbon tetrachloride and trichloroethane, freons, halons [used in firefighting]) creates **free chlorine atoms** that destroy ozone.

- **Bromine** containing compounds called **halons** and **HBFCs**, i.e. **hydrobromo fluorocarbons** [both used in **fire extinguishers** and **methyl bromide** (a widely used pesticide)] release bromine atoms similar to CFCs that release chlorine atoms.
- Each bromine atom destroys **hundred times** of more ozone molecules than what a chlorine atom does.

Measures to Prevent Ozone (O₃) Layer Depletion

Monitoring of ozone layer is taken up by

1. World Meteorological Organization (WMO)
2. World Weather Watch (WWW)
3. Integrated Global Ocean Services Systems (IGOSS)
4. Global Climate Observing System (GCOS)

CFC substitutes

- Further, use of HCFCs (Hydrochloric fluorocarbons) as a substitute for CFCs is being recommended on temporary basis because HCFCs are relatively less damaging to ozone layer as compared to CFCs, but they are not completely ozone safe.

Acid Rain – Causes, Effects | Ocean Acidification

Acid Rain – Acidification

- Acid rain refers to any precipitation (rain, fog, mist, snow) that is more acidic than normal (pH of less than 5.6. [pH below 7 = acidic]).
- Acid rain is caused by atmospheric pollution from acidic gases such as **sulphur dioxide** and **oxides of nitrogen** emitted from burning of fossil fuels.
- It is also recognized that acidic smog, fog, mist, move out of the atmosphere and settle on dust particles which in turn accumulate on vegetation as acid depositions. When rain falls, the acid from these depositions leak and form acid dews.

The pH scale

- The pH scale is a measure of how acidic or basic (alkaline) a solution is.
- It ranges from 0 to 14. A pH of 7 is neutral.
- A pH less than 7 is acidic, and a pH greater than 7 is basic.
- It is based on **hydrogen ion concentration** in an aqueous solution.
- pH values decreases as hydrogen ion levels increases.
- A solution with pH 4 is ten times more acidic than solution with pH 5, and a hundred times more acidic than solution with pH 6.

- Whilst the pH range is usually given as 0 to 14, lower and higher values are theoretically possible.

Water Pollution - Causes, Control Measures

Water Pollution

- **Water pollution** is the addition/presence of undesirable substances to/in water such as organic, inorganic, biological, radiological, heat, which degrades the quality of water so that it becomes unfit for use'.
- **Water pollution** is caused by a variety of human activities such as industrial, agricultural and domestic.
- Natural sources of pollution of water are soil erosion, leaching of minerals from rocks and decaying of organic matter.

Point and non-point sources of pollution

- Rivers, lakes, seas, oceans, estuaries and ground water sources may be polluted by point or non-point sources.
- When pollutants are discharged from a specific location such as a drain pipe carrying industrial effluents discharged directly into a water body it represents point source pollution.
- In contrast non-point sources include discharge of pollutants from diffused sources or from a larger area such as run off from agricultural fields, grazing lands, construction sites, abandoned mines and pits, roads and streets.

Causes of Water Pollution

Sewage Water

- Sewage water include discharges from houses, commercial and industrial establishments connected to public sewerage system.
- The sewage contains human and animal excreta, food residues, cleaning agents, detergents and other wastes.
- Domestic and hospital sewage contain many undesirable pathogenic microorganisms, and its disposal into a water without proper treatment.

Putrescibility is the process of decomposition of organic matter present in water by microorganisms using oxygen.

Dissolved Oxygen (DO) – Biological Oxygen Demand (BOD) – Chemical oxygen demand (COD)

DO

- Presence of organic and inorganic wastes in water decreases the **dissolved Oxygen (DO)** content of the water.
- Water having **DO content below 8.0 mg/L** may be considered as contaminated. Water having DO content below 4.0 mg/L is considered to be highly polluted.
- **DO content of water** is important for the survival of aquatic organisms. A number of factors like surface turbulence, photosynthetic activity, **O₂ consumption** by organisms and decomposition of organic matter are the factors which determine the amount of DO present in water.
- The higher amounts of waste increases the rates of decomposition and O₂ consumption, thereby decreases the DO content of water.

BOD

- The demand for O₂ is directly related to increasing input of organic wastes and is expressed as **biological oxygen demand (BOD)** of water.
- Water pollution by organic wastes is measured in terms of **Biochemical Oxygen Demand (BOD)**.
- BOD is the amount of dissolved oxygen needed by bacteria in decomposing the organic wastes present in water. It is expressed in milligrams of oxygen per litre of water.
- The higher value of BOD indicates low DO content of water. Since BOD is **limited to biodegradable materials**. Therefore, it is not a reliable method of measuring pollution load in water.

COD

- **Chemical oxygen demand (COD)** is a slightly better mode used to measure pollution load in water.
- COD measures the amount of oxygen in parts per million required to oxidize **organic (biodegradable and non-biodegradable)** and **oxidizable inorganic** compounds in the water sample.

Industrial Wastes

- The industries discharge several inorganic and organic pollutants, which may prove highly toxic to the living beings.
- Discharge of waste water from industries like petroleum, paper manufacturing, metal extraction and processing, chemical manufacturing, etc., that often contain toxic substances, notably, heavy metals (defined as elements with density > 5 g/cm³ such as **mercury, cadmium, copper, lead, arsenic**) and a variety of organic compounds.

Agricultural sources

- Agricultural runoff contains dissolved salts such as **nitrates, phosphates, ammonia** and other nutrients, and toxic metal ions and organic compounds.
- Fertilizers contain major plant nutrients such as **nitrogen, phosphorus** and **potassium**.
- Excess fertilizers may reach the ground water by leaching or may be mixed with surface water of rivers, lakes and ponds by runoff and drainage.
- Pesticides include insecticides, fungicides, herbicides, nematicides, rodenticides and soil fumigants. They contain a wide range of chemicals such as **chlorinated hydrocarbons (CHCs. E.g. DDT, Endosulfan etc.)**, **organophosphates, metallic salts, carbonates, thiocarbonates, derivatives of acetic acid**. Many of the pesticides are non-degradable and their residues have long life.
- The animal excreta such as dung, wastes from poultry farms, piggeries and slaughter houses etc. reach the water through runoff and surface leaching during rainy season.

Thermal and Radiation Pollution

- **Power plants – thermal and nuclear**, chemical and other industries use lot of water for cooling purposes and the used hot water is discharged into rivers, streams or oceans.
- Discharge of hot water may increase the temperature of the receiving water by 10 to 15 °C above the ambient water temperature. This is thermal pollution.
- Increase in water temperature **decreases dissolved oxygen** in water which adversely affects aquatic life.
- Unlike terrestrial organisms, aquatic organisms are adapted to a uniform steady temperature of environment. Sudden rise in temperature kills fishes and other aquatic animals.
- Discharge of hot water in water body affects feeding in fishes, increases their metabolism and affects their growth. Their swimming efficiency declines. Running away from predators or chasing prey becomes difficult. Their resistance to diseases and parasites decreases.
- One of the best methods of reducing thermal pollution is to store the hot water in cooling ponds, allow the water to cool before releasing into any receiving water body.
- Nuclear accidents near water bodies or during natural calamities like tsunami and earthquakes pose the risk of radiation leakage (radiation exposure) into water bodies. E.g. Fukushima Daiichi nuclear disaster.

Radiation exposure causes **mutations in DNA** of marine organisms. If those mutations are not repaired, the cell may turn cancerous.

Radioactive iodine tends to be absorbed by the thyroid gland and can cause thyroid cancer.

Oil Spills

- Oil spills are most glaring of all oceanic pollution.

- The most common cause of oil spill is leakage during marine transport and leakage from underground storage tanks. Oil spill could occur during offshore oil production as well.

Impact of oil spill on marine life

- Oil being lighter than water covers the water surface as a thin film cutting off oxygen to floating plants and other producers.
- Within hours of oil spill, the fishes, shellfish, plankton die due to suffocation and metabolic disorders.
- Birds and sea mammals that consume dead fishes and plankton die due to poisoning. Death of these organisms severely damages marine ecosystems.

Impact of oil spills on terrestrial life

- Bays, estuaries, shores, reefs, beaches particularly near large coastal cities or at the mouth of rivers are relatively more susceptible to the hazards of oil spills.
- A number of coastal activities, especially recreational such as bathing, boating, angling, diving, rafting are affected. As a result tourism and hotel business in the coastal areas suffers seriously.

Invasive species

- Plants of **water hyacinth** are the world's most problematic aquatic weed, also called '**Terror of Bengal**'.
- They grow abundantly in **eutrophic water bodies**, and lead to an imbalance in the ecosystem dynamics of the water body.
- They cause havoc by their excessive growth leading to stagnation of polluted water.

Underground water pollution

- In India at many places, the ground water is threatened with contamination due to seepage from industrial and municipal wastes and effluents, sewage channels and agricultural runoff.
- Pollutants like fluorides, **uranium**, heavy metals and nutrients like nitrates and phosphates are common in many parts of India.

Marine pollution

- Oceans are the ultimate sink of all natural and manmade pollutants.
- Rivers discharge their pollutants into the sea.
- The sewerage and garbage of coastal cities are also dumped into the sea.

- The other sources of oceanic pollution are navigational discharge of oil, grease, detergents, sewage, garbage and radioactive wastes, off shore oil mining, oil spills.

Water Pollution Control Measures

- Realizing the importance of maintaining the cleanliness of the water bodies, the Government of India has passed the **Water (Prevention and Control of Pollution) Act, 1974** to safeguard our water resources.
- An ambitious plan to save the river, called the **Ganga Action Plan** was **launched in 1985**. It aimed to reduce the pollution levels in the river. However, the increasing population and industrialization have already damaged this mighty river beyond repair.
- In India, the **Central Pollution Control Board (CPCB)**, an apex body in the field of water quality management, has developed a concept of “designated best use”.
- Accordingly the water body is designated as A, B, C, D, E on the basis of
 - pH,
 - dissolved oxygen, mg/l
 - BOD, (200C) mg/l
 - total coliform (MPN/100ml)
 - free ammonia mg/l,
 - Electrical conductivity etc.
- The **CPCB**, in collaboration with the concerned **State Pollution Control Boards**, has classified all the water bodies including coastal waters in the country according to their “designated best uses”.
- This classification helps the water quality managers and planners to set water quality targets and identify needs and priority for water quality restoration programmes for various water bodies in the country.
- The famous **Ganga Action Plan** and subsequently the **National River Action Plan** are results of such exercise.
- **Riparian buffers:** A riparian buffer is a vegetated area (a "buffer strip") near a stream, usually forested, which helps shade and partially protect a stream from the impact of adjacent land uses. It plays a key role in increasing water quality in associated streams, rivers, and lakes, thus providing environmental benefits.
- Treatment of sewage water and the industrial effluents before releasing it into water bodies. Hot water should be cooled before release from the power plants.
- Excessive use of fertilizers and pesticides should be avoided. Organic farming and efficient use of animal residues as fertilizers can replace chemical fertilizers.
- **Water hyacinth** (an **aquatic weed, invasive specie**) can purify water by taking some toxic materials and a number of heavy metals from water.

- Oil spills in water can be cleaned with the help of **bregoli** — a by-product of paper industry resembling saw dust, oil zapper, microorganisms.
- It has been suggested that we should plant **eucalyptus** trees all along sewage ponds. These trees absorb all surplus wastewater rapidly and release pure water vapor into the **atmosphere**.

Bioremediation

- **Bioremediation** is the use of microorganisms (bacteria and fungi) to degrade the environmental contaminants into less toxic forms.
- The microorganisms may be indigenous to a contaminated area or they may be isolated from elsewhere and brought to the contaminated site.
- The process of bioremediation can be monitored indirectly by measuring the **Oxidation Reduction Potential or redox** in soil and groundwater, together with pH, temperature, oxygen content, electron acceptor/donor concentrations, and concentration of breakdown products (e.g. carbon dioxide)

In situ bioremediation

- **In situ** — It involves treatment of the contaminated material at the site.
- **Bioventing**: supply of air and nutrients through wells to contaminated soil to stimulate the growth of indigenous bacteria. It is used for simple hydrocarbons and can be used where the contamination is deep under the surface.
- **Biosparging**: Injection of air under pressure below the water table to increase groundwater oxygen concentrations and enhance the rate of biological degradation of contaminants by naturally occurring bacteria
- **Bioaugmentation**: Microorganisms are imported to a contaminated site to enhance degradation process.

Using bioremediation techniques, **TERI** has developed a mixture of bacteria called '**Oilzapper and Oilivorous-S'** which degrades the pollutants of oil-contaminated sites, leaving behind no harmful residues. This technique is not only environment friendly, but also highly cost-effective.

Effects of Water Pollution on Human Health

- Domestic and hospital sewage contain many undesirable pathogenic microorganisms, and its disposal into a water without proper treatment may cause outbreak of serious diseases, such as, amoebiasis dysentery, typhoid, jaundice, cholera, etc.
- Metals like **lead, zinc, arsenic, copper, mercury** and **cadmium** in industrial waste waters adversely affect humans and other animals.
- **Arsenic pollution** of ground water has been reported from West Bengal, Orissa, Bihar, Western U.P. Consumption of such arsenic polluted water leads to accumulation of arsenic in the

body parts like blood, nails and hairs causing skin lesions, rough skin, dry and thickening of skin and ultimately **skin cancer**.

- Mercury compounds in waste water are converted by bacterial action into extremely toxic **methyl mercury**, which can cause numbness of limbs, lips and tongue, deafness, blurring of vision and mental derangement.
- Pollution of water bodies by mercury causes **Minamata** (neurological syndrome) disease in humans and **dropsy** in fishes.
- Lead causes **lead poisoning** (Lead interferes with a variety of body processes and is toxic to many organs and tissues). The compounds of lead cause anaemia, headache, loss of muscle power and bluish line around the gum.
- Cadmium poisoning causes cancer of lungs and liver and **Itai – Itai disease** (a painful disease of bones and joints, causes softening of the bones and kidney failure) etc.
- Water contaminated with cadmium can cause **itai itai disease** also **called ouch-ouch disease** (a **painful disease of bones and joints**) and cancer of lungs and liver.

Soil Pollution

- Soil pollution is defined as the 'addition of substances to the soil, which adversely affect physical, chemical and biological properties of soil and reduces its productivity.
- It is build-up of persistent toxic compounds, chemicals, salts, radioactive materials, or disease causing agents in soil which have adverse effects on plant growth, human and animal health.

Causes and Sources of Soil Pollution

Plastic bags

- They accumulate in soil and prevents germination of seeds. They stay in soil for centuries without decomposing (non-biodegradable).
- Burning of plastic in garbage dumps release highly toxic and poisonous gases like **carbon monoxide, carbon dioxide, phosgene, dioxins** and other poisonous **chlorinated compounds**.
- Toxic solid residue left after burning remains in soil. The harmful gases enters soils through chemical cycles.

Industrial sources

- They includes **fly ash, metallic residues, mercury, lead, copper, zinc, cadmium, cyanides, thiocyanates, chromates, acids, alkalies, organic substances, nuclear wastes**
- Large number of industrial chemicals, dyes, acids, etc. find their way into the soil and are known to create many health hazards including cancer.

Pesticides

- Pesticides are chemicals that include insecticides, fungicides, algicides, rodenticides, weedicides sprayed in order to improve productivity of agriculture, forestry and horticulture.
- **Chlorohydrocarbons (CHCs) like DDT, endosulfan, heptachlor** accumulate in soil and cause biomagnification. Some of these pesticides like DDT and endosulfan are banned by most of the countries.

Fertilizers and manures

- Excessive use of chemical fertilizers **reduces the population of soil borne organisms** and the crumb structure of the soil, productivity of the soil and increases salt content of the soil.

Discarded materials

- It includes concrete, asphalt, rungs, leather, cans, plastics, glass, discarded food, paper and carcasses.

Radioactive wastes

- Radioactive elements from mining and nuclear power plants, find their way into water and then into the soil.

Other pollutants

- Many air pollutants (acid rain) and water pollutants ultimately become part of the soil and the soil also receives some toxic chemicals during weathering of certain rocks.

Effects of soil pollution

Agriculture

- Reduced soil fertility due to increase in alkalinity, salinity or pH.
- Reduced crop yield due to reduced fertility.
- Reduced nitrogen fixation due to the reduced number of nitrogen fixers.
- Increased erosion due to loss of forests and other vegetation.
- Run off due to deforestation cause loss of soil and nutrients.
- Deposition of silt in tanks and reservoirs due to soil erosion.

Environment

- Ecological imbalance.

- Foul smell and release of gases.
- Waste management problems.

Control measures

More or less same as for water pollution

- Indiscriminate disposal of solid waste should be avoided.
- To control soil pollution, it is essential to stop the use of plastic bags and instead use bags of degradable materials like paper and cloth.
- Sewage should be treated properly before using as fertilizer and as landfills.
- The organic matter from domestic, agricultural and other waste should be segregated and subjected to vermicomposting which generates useful manure as a byproduct.
- The industrial wastes prior to disposal should be properly treated for removing hazardous materials.
- Biomedical waste should be separately collected and incinerated in proper incinerators.
- Use of bio pesticides, bio fertilizers. Organic farming.
- Four R's: Refuse, Reduce, Reuse, and Recycle.
- Afforestation and Reforestation.
- Solid waste treatment.
- Reduction of waste from construction areas.

Noise Pollution

- Noise by definition is "sound without value" or "any noise that is unwanted by the recipient".
- Noise level is measured in terms of decibels (dB). An increase of about 10 dB is approximately double the increase in loudness.
- H.O. (World Health Organization) has prescribed optimum noise level as 45 dB by day and 35 dB by night. Anything above 80 dB is hazardous.

Effects of noise pollution

- Noise pollution leads to irritation, increased blood pressure, loss of temper, mental depression and annoyance, decrease in work efficiency, loss of hearing which may be first temporary but can become permanent in the noise stress continues.

Prevention and control of noise pollution

- Road traffic noise can be reduced by better designing and proper maintenance of vehicles.

- Noise abatement measures include creating noise mounds, noise attenuation walls and well maintained roads and smooth surfacing of roads.
- **Retrofitting of locomotives**, continuously welded rail track, use of electric locomotives or deployment of quieter rolling stock will reduce noises emanating from trains.
- Air traffic noise can be reduced by appropriate insulation and introduction of noise regulations for takeoff and landing of aircrafts at the airport.
- Industrial noises can be reduced by sound proofing equipment like generators and areas producing lot of noise.
- Power tools, very loud music and land movers, public functions using loudspeakers, etc. should not be permitted at night. Use of horns, alarms, refrigeration units, etc. is to be restricted. Use of fire crackers which are noisy and cause air pollution should be restricted.
- A **green belt of trees** is an efficient noise absorber.
- The Government of **India on Mar 2011** launched a **Real time Ambient Noise Monitoring Network**.
- Under this network, in **phase-I, five Remote Noise Monitoring Terminals** each have been installed in different noise zones in seven metros (**Delhi, Hyderabad, Kolkata, Mumbai, Bangalore, Chennai and Lucknow**).
- In **Phase II another 35** monitoring stations will be installed in the same seven cities. Phase III will cover installing **90 stations in 18 other cities**.
- **Phase-III cities** are **Kanpur, Pune, Surat, Ahmedabad, Nagpur, Jaipur, Indore, Bhopal, Ludhiana, Guwahati, Dehradun, Thiruvananthapuram, Bhubaneswar, Patna, Gandhinagar, Ranchi, Amritsar and Raipur**.
- **Silence Zone** is an area comprising not less than **100 metres** around hospitals, educational institutions, courts, religious places or any other area declared as such by a competent authority.

HARZARDIOUS WASTE

Any solid waste, other than **radioactive wastes**, which by reasons of physical and/or chemical or reactive or toxic, explosive, corrosive or other characteristics causing danger or likely to cause danger to health or environment whether alone or when coming in contact with other waste or environment.

Parameters for Hazard Potential.

Parameter	Defining Characteristics	Example
Corrosivity	Waste which have pH < 2.0 or > 12.0 or which corrodes steel at a rate greater than 6.35 mm per year at 55°C.	Acidic waste, spent pickle liquor.
Reactivity	Wastes, which are unstable and spontaneously react with water or air, generate toxic gases and explode due to shock or heat.	Water from TNT operation and used Cyanide solvents.
Ignitability	Wastes which spontaneously ignite in dry or moist air at or below 60°C.	Waste oils, used solvents.
Toxicity	Wastes which release toxic materials on leaching in sufficient amounts to pose a substantial hazard to human health or environment as measured by the Toxicity Characteristics Leaching Procedure (TCLP)	Metals bearing wastes.

Solid waste

Solid waste is a collective term used to distinguish **non-biodegradable materials** and **discards** that come from sources like:

- ❖ Households
- ❖ Businesses and Commercial establishments
- ❖ Manufacturers or Industrial sites
- ❖ Biomedical sources like hospital and clinics.

They are the trash collected by the **municipal waste management** units for segregation according to the process of disposal.

Solid wastes are generally composed of **non-biodegradable** and **non-compostable biodegradable materials**. The latter refer to solid wastes whose **bio deterioration** is not complete; in the sense that the enzymes of microbial communities that feed on its residues cannot cause its disappearance or conversion into another compound.

Parts of **liquid waste materials** are also considered as **solid wastes**, where the dredging of liquid wastes will leave solid sedimentation, to which proper waste management techniques should also be applied.

Solid waste pollution is when the environment is filled with **non-biodegradable** and **non-compostable biodegradable wastes** that are capable of emitting **greenhouse gases, toxic fumes, and particulate matters** as they accumulate in open landfills.

These wastes are also capable of leaching organic or chemical compositions to contaminate the ground where such wastes lay in accumulation.

Solid wastes carelessly thrown in **streets, highways**, and alleyways can cause pollution when they are carried off by rainwater run-offs or by flood water to the main streams, as these contaminating residues will reach larger bodies of water.

LIQUID WASTE –

Liquid wastes are the liquid part of the waste material. **Liquid waste** includes effluents of industries, **fertilizer and pesticide** solutions from agricultural fields, leachate from landfills, urban runoff of untreated waste water and garbage, mining wastes etc. The liquid waste may contain nontoxic inorganic substances or toxic organic substances.

Some important liquid waste management methods are as follows:

1. Sewage treatment - This process involves the following methodology:

- ❖ Dilution
- ❖ Mechanical treatment
- ❖ Biological treatment
- ❖ Chemical treatment

2. Removal of ammonia- The treatment of industrial effluents in Effluent Treatment involves chemical or primary treatment (by methods of neutralization, sedimentation, coagulation, precipitation etc.) followed by biological or secondary treatment (by activated sludge and trickling filter method) and tertiary treatment (by methods of ion exchange, reverse osmosis, chemical oxidation).

3. Effluent water can be used to grow algae and aquatic plants to produce biomass for biogas plants.

4. The sewage with organic nutrients is stored in specially constructed shallow ponds called as oxidizing or stabilizing pond. In the pond, green algae and bacteria grow in presence of sun light, consuming organic nutrients. This water contains enough nitrogen, phosphorous and potassium and is highly helpful for the growth of plants.

GASEOUS WASTE - Gaseous waste are waste products in gas form resulting from various human activities like manufacturing, processing, material consumption, biological processes etc. The gaseous wastes include carbon dioxide (CO₂), methane (CH₄), chlorofluorocarbon (CFC), oxides of nitrogen (NO_x), carbon monoxide (CO), oxides of sulphur (SO_x) etc. These gaseous wastes can cause serious environmental hazards. Therefore, it is highly essential to take appropriate steps for the proper management and control of gaseous wastes in the environment.

Some of the control measures are:

- ❖ The gaseous pollutant like SO₂, H₂S, NH₃ etc can be removed by absorption in (using appropriate liquid) wet scrubbers.
- ❖ The industries should use precipitators, scrubbers and filters to check production of particulate matter.
- ❖ There should be large scale of plantation which will reduce CO₂ level and increase O₂ level of atmosphere.
- ❖ Air cleaning devices like gravity settlers, cyclone separators, wet collectors, electrostatic precipitators etc. should be used for the cleaning of air before their discharge into atmosphere.
- ❖ Public awareness should be created regarding hazards of air pollutant accumulation in environment.

Biomedical waste

Biomedical waste is any kind of waste containing **infectious** (or potentially infectious) materials. It may also include waste associated with the generation of biomedical waste that visually appears to be of medical or laboratory origin (e.g., packaging, unused bandages, infusion kits, etc.), as well as research laboratory waste containing **biomolecules or organisms that are many restricted from environmental release**. Biomedical waste are contaminated due to the possibility of being contaminated with **blood** and their propensity to cause **injury** when not properly contained and disposed of. Biomedical waste is a type of **biowaste**.

Biomedical waste may be **solid or liquid**. **Examples of infectious waste** include discarded blood, sharps, unwanted microbiological cultures and stocks, identifiable body parts (including those as a result of amputation), other human or animal tissue, used bandages and dressings, discarded gloves, other medical supplies that may have been in contact with blood and body fluids, and laboratory waste.

Biomedical waste is generated from biological and **medical sources and activities**, such as the **diagnosis, prevention, or treatment of diseases**. Common generators (or producers) of biomedical waste include **hospitals, health clinics, nursing homes, emergency medical services**, medical research laboratories, offices of physicians, dentists, and veterinarians, home health care, and morgues or funeral homes. In healthcare facilities (i.e., hospitals, clinics, doctor's offices, veterinary hospitals and clinical laboratories), waste with these characteristics may alternatively be called medical or clinical waste.

Biomedical waste is distinct from **normal trash or general waste**, and differs from other types of **hazardous waste**, such as **chemical, radioactive**, universal or industrial waste. Medical facilities generate waste hazardous chemicals and radioactive materials. While such wastes are normally not infectious, they require proper disposal. Some wastes are considered multi-hazardous, such as tissue samples preserved in formalin.

Medical Waste Treatment Methods

Incineration. Before 1997, over 90% of all infectious medical waste was disposed of by incineration. Changes to EPA regulations has led providers to seek other disposal means. This is still the only method used on pathological waste, for example body parts and recognizable tissues.

Autoclaving. Steam sterilization renders **bio hazardous waste non-infectious**. After it's been sterilized, the waste can be disposed of normally in solid waste landfills, or it can be incinerated under less-stringent regulation.

Microwaving. Another way to render hazardous healthcare waste non-hazardous is to microwave it with high-powered equipment. As with autoclaving, this method opens up the waste to normal landfill disposal or incineration afterward.

Chemical. Some kinds of chemical waste may be neutralized by applying reactive chemicals that render it inert. This is generally reserved for waste that's chemical in nature.

Biological. This experimental method of treating biomedical waste uses enzymes to neutralize hazardous, infectious organisms. It's still under development and rarely used in practice.

NATURAL RESOURCES

Natural resources are materials and **components** that can be found within the **environment**. Every man-made product is composed of natural resources. A natural resource may exist as a separate entity such as **fresh water**, and **air**, as well as a living organism such as a fish, or it may exist in an alternate form which must be processed to obtain the resource such as metal ores, oil, and most forms of energy.

Classification

There are various methods of categorizing **natural resources**, these include source of origin, stage of development, and by their renewability, these classifications are described below. On the basis of origin, resources may be divided into:

Biotic – Biotic resources are obtained from the **biosphere** (**living and organic material**), such as **forests** and **animals**, and the materials that can be obtained from them. **Fossil fuels** such as **coal** and **petroleum** are also included in this category because they are formed from decayed organic matter.

Abiotic – **Abiotic** resources are those that come from **non-living**, non-organic material. **Examples of abiotic resources** include **land**, **fresh water**, **air** and heavy metals including ores such as gold, iron, copper, silver, etc

Natural resources can be categorized as either renewable or non-renewable:

Renewable resources are ones that can be **replenished naturally**. Some of these resources, like **sunlight**, **air**, **wind**, etc., are **continuously available** and their quantity is not noticeably affected by human consumption. Though many **renewable resources** do not have such a rapid recovery rate, these resources are susceptible to depletion by over-use. **Resources** from a human use perspective are classified as renewable only so long as the rate of replenishment/recovery exceeds that of the rate of consumption.

Non-renewable resources are resources that form **extremely slowly** and those that do **not naturally** form in the **environment**. **Minerals** are the most common resource included in this category. By the human perspective, resources are **non-renewable** when their rate of consumption exceeds the rate of replenishment/recovery; a **good example** of this are **fossil fuels**, which are in this category because their rate of formation is extremely slow (potentially millions of years), meaning they are considered non-renewable. Some resources actually naturally deplete in amount without human interference, the most notable of these being radio-active elements such as uranium, which naturally decay into **heavy metals**. Of these, the metallic minerals can be re-used by recycling them, **but coal and petroleum cannot be recycled**.

EARTH RESOURCES

1) Atmosphere: The atmosphere forms a protective shell over the earth. The **lowest layer**, the **troposphere**, the only part warm enough for us to survive in, is only **12 kilometers** thick. The **stratosphere** is **50 kilometers** thick and contains a layer of **sulphates** which is important for the formation of **rain**. It also contains a **layer of ozone**, which absorbs **ultra-violet light known to cause cancer and without which**, no life could exist on earth. It is a complex **dynamic system**. If its nature is disrupted it affects all mankind. Most air pollutants have both global and regional effects. Major pollutants of air are created by industrial units that release various gases such as carbon dioxide, carbon monoxide and toxic fumes into the air. The buildup of **carbon dioxide** which is known as 'greenhouse effect' in the atmosphere is leading to current global warming.

2) Hydrosphere: The hydrosphere covers three quarters of the earth's surface. A major part of the hydrosphere is the marine ecosystem in the ocean, while only a small part occurs in fresh water. Fresh water in rivers, lakes and glaciers, is perpetually being renewed by a process of evaporation and rainfall. Some of this fresh water lies in underground aquifers. Human activities such as deforestation create serious changes in the hydrosphere. Once land is denuded of vegetation, the rain erodes the soil which is washed into the sea. Chemicals from industry and sewage find their way into rivers and into the sea.

- ❖ **Coliform** is a group of bacteria, found in human intestines, whose presence in water indicates contamination by disease-causing microorganisms.

3) Lithosphere: The lithosphere began as a hot ball of matter which formed the earth about 4.6 billion years ago. About 3.2 billion years ago, the earth cooled down considerably and a very special event took place - life began on our planet. The crust of the earth is 6 or 7 kilometers thick and lies under the continents. Of the 92 elements in the lithosphere only eight are common constituents of crustal rocks. Of these constituents,

- ❖ 47% is oxygen,
- ❖ 28% is silicon,
- ❖ 8% is aluminum,
- ❖ 5% is iron,

4) Biosphere: This is the relatively thin layer on the earth in which life can exist. Within it the air, water, rocks and soil and the living creatures, form structural and functional ecological units, which together can be considered as one giant global living system, that of our Earth itself. Within this framework, those characterized by broadly similar geography and climate, as well as communities of plant and animal life can be divided for convenience into different bio-geographical realms. These occur on different continents. Within these, smaller bio-geographical units can be identified on the basis of structural differences and functional aspects into distinctive recognizable ecosystems, which give a distinctive character to a landscape or waterscape. The simplest of these ecosystems to understand is a pond. It can be used as a model to understand the nature of any other ecosystem and to appreciate the changes over time that is seen in any ecosystem.

Biomass [Conventional Source]

Biomass is a renewable energy resource derived from plant and animal waste. The energy from biomass (biomass conversion) is released on burning or breaking the chemical bonds of organic molecules formed during photosynthesis.

Biomass fuels can be used directly or they can be transformed into more convenient form and then used.

Sources of biomass

By-products from the timber industry, agricultural crops and their byproducts, raw material from the forest, major parts of household waste and wood.

Solid Biomass fuels: Wood logs and wood pellets, charcoal, agricultural waste (stalks and other plant debris), animal waste (dung), aquatic plants (kelp and water hyacinths) urban waste (paper, cardboard and other combustible materials).

- ❖ Conversion to gaseous and liquid biofuels
- ❖ Biomass can be converted into alcohol (liquid biofuels) by distillation.
- ❖ Liquid Biofuels: Ethanol, Methanol, Gasohol, Biodiesel.

Gaseous Biofuels: Synthetic natural gas (biogas), Wood gas: Methane – 70% and CO₂ – 30%.

Instead of burning loose biomass directly, it is more practical to compress it into briquettes (compressing them into blocks of a chosen shape) improve its utility and convenience of use.

Such biomass in the biomass briquettes can be used as fuel in place of coal in traditional furnaces or in a gasifier. A gasifier converts solid fuels into a more convenient-to-use gaseous fuel called producer gas.

Uses of biomass

- ❖ In the developed world biomass is becoming important for applications such as combined heat and power generation.
- ❖ Biomass energy is gaining significance as a source of clean heat for domestic heating and community heating applications.

Advantages of biomass energy

- ❖ Burning of biomass does not increase atmospheric carbon dioxide because to begin with biomass was formed by atmospheric carbon dioxide and the same amount of carbon dioxide is released on burning.
- ❖ Biomass is an important source of energy and the most important fuel worldwide after coal, oil and natural gas.
- ❖ Biomass is renewable and is abundantly available on the earth in the form of firewood, agricultural residues, cattle dung, city garbage etc.
- ❖ Bio-energy, in the form of biogas, which is derived from biomass, is expected to become one of the key energy resources for global sustainable development.

Bagasse as biofuel

- ❖ Indian sugar mills are rapidly turning to bagasse, the leftover of cane after it is crushed and its juice extracted, to generate electricity.
- ❖ This is mainly being done to clean up the environment, cut down power costs and earn additional revenue.

Biogas plant

- ❖ The biogas plant consists of two components: a digester (or fermentation tank) and a gas holder.
- ❖ The gas holder cuts off air to the digester (anaerobiosis) and collects the gas generated.
- ❖ Any biodegradable (that which can be decomposed by bacteria) substance can be fermented anaerobically (in absence of oxygen) by methane-producing (methanogenic) bacteria.
- ❖ Cowdung or faeces are collected and put in a biogas digester or fermenter (a large vessel in which fermentation can take place).
- ❖ A series of chemical reactions occur in the presence of methanogenic bacteria (CH₄ generating bacteria) leading to the production of CH₄ and CO₂.

Geothermal Energy

Geothermal Energy is the **thermal energy** generated by the **radioactive decay** of **materials** in the **earth's interior**, it can be harnessed virtually anywhere on the Earth's but viable methods are possible only at the surface or near-surface **manifestations**. These **manifestations** are only limited to some parts of the world. It is a very nascent **renewable source of energy**. Even though surface **manifestation** like hot springs have been used by humans since ancient times, the first geothermal pumps were used in the 1940's and the first geothermal electric plant became operational only in 1960. Many countries since then have been investing in geothermal energy as a clean and renewable energy source, it is more relevant now than ever.

- ❖ Geothermal energy is natural heat from the interior of the earth that can be used to generate electricity as well as to heat up buildings.
- ❖ The core of the earth is very hot and it is possible to make use of this geothermal energy.
- ❖ These are areas where there are volcanoes, hot springs, and geysers, and methane under the water in the oceans and seas.
- ❖ In some countries, such as in the USA water is pumped from underground hot water deposits and used for heating of houses.
- ❖ Geothermal resource falls into three major categories: i) Geo-pressurized zones, ii) hot-rock zones and iii) Hydrothermal convection zones. Of these three only the first is currently being exploited on a commercial basis.

Geothermal energy in India

- ❖ In India, Northwestern **Himalayas** and the **western coast** are considered geothermal areas.
- ❖ The Geological Survey of India has already identified more than **350 hot spring sites**, which can be explored as areas to tap **geothermal energy**.
- ❖ The **Puga valley in the Ladakh region** has the most promising **geothermal field**.

Indian organizations working in geothermal energy:

- ❖ Central Electricity Authority
- ❖ Geological Survey of India
- ❖ Indian Institute of Technology, Mumbai
- ❖ Regional Research Laboratory, Jammu
- ❖ National Geophysical Research Institute, Hyderabad
- ❖ Oil and Natural Gas Corporation, Dehradun

Currently there are no geothermal power plants operating in our country, however work is **underway on two projects**.

Ongoing Projects in India:

- ❖ Magneto-telluric investigations in Tattapani geothermal area in Madhya Pradesh
- ❖ Magneto-telluric investigations in Puga geothermal area in Ladakh region, the new Union territory.
- ❖ **Environmental impact of geothermal energy**
 - ❖ Geothermal energy can pose several environmental problems which includes on-site noise, emissions of gas and disturbance at drilling sites.
 - ❖ The steam contains hydrogen sulphide gas, which has the odour of rotten eggs, and cause air pollution.

- ❖ The minerals in the steam are also toxic to fish and they are corrosive to pipes, and equipment, requiring constant maintenance.

Hydrogen Energy

- ❖ Many scientists believe that the fuel for the future is **hydrogen gas**.
- ❖ When hydrogen gas burns in the air or in fuel cells, it combines with oxygen gas to produce non-polluting water vapour and fuel cells directly convert hydrogen into electricity.
- ❖ Widespread use of hydrogen as fuel would greatly reduce the problem of air pollution and danger of global warming because there will not be any **CO₂** emission.
- ❖ **Hydrogen** may be a clean source of energy but getting large amount of pure hydrogen for commercial purposes is a problem because hydrogen is present in combination with other elements such as oxygen, carbon and nitrogen thus hydrogen has to be produced from either water or organic compounds like methane etc. requiring large amounts of energy. This is a very costly proposition.
- ❖ Producing hydrogen from **algae** in large scale cultures is possible. It may be possible to control photosynthesis so that green algae are able to produce hydrogen through the process of photosynthesis.
- ❖ Hydrogen is a **pollution free**, cost effective manner and if technologies such as fuel cells can be made cost effective, then hydrogen has the potential to provide clean, alternative energy for diverse uses, including lighting, power, heating, cooling, transportation and many more.

Fuel Cell Technology

- ❖ **Fuel cells** are highly efficient power-generating systems that produce electricity by combining fuel (**hydrogen**) and oxygen in an electrochemical reaction.
- ❖ Fuel cells are electrochemical devices that convert the chemical energy of a fuel directly and very efficiently into electricity (**DC**) and heat, thus doing away with combustion.
- ❖ Hydrogen and phosphoric acid are the most common type of fuel cells, although fuel cells that run on methanol, ethanol, and natural gas are also available.
- ❖ The most suitable fuel for such cells is hydrogen or a mixture of compounds containing hydrogen.
- ❖ A fuel cell consists of an electrolyte sandwiched between two electrodes. Oxygen passes over one electrode and hydrogen over the other, and they react electrochemically to generate electricity, water, and heat.
- ❖ Though rapid progress has been made; high initial cost is still the biggest hurdle in the widespread commercialization of fuel cells.
- ❖ The rapidly depleting fossil fuel sources of energy and escalating demand of energy have made it necessary to look for alternative sources of energy that are known as renewable or inexhaustible. We can define inexhaustible energy resources as 'those resources which can be harnessed without depletion'. Most of these resources are free from pollution and some of them can be used at all places. These renewable energy resources are also known as **non-conventional** or **inexhaustible** or alternate energy sources. These energy sources are solar, flowing water, wind, hydrogen and **geothermal**. We get renewable solar energy directly from the sun and indirectly from moving water, wind and **biomass**. Like fossil fuels and nuclear power, each of these alternatives renewable sources of energy has their own advantages and disadvantages. We are going to discuss some of them in detail.

Solar Energy

- ❖ Direct solar energy can be used as heat, light, and electricity through the use of solar cells.
- ❖ Direct use of solar energy can be used through various devices broadly directed into three types of systems a) passive, b) active c) photovoltaic.

Passive solar energy

As you know some of the earliest uses of solar energy were passive in nature such as to evaporate sea water for producing salt and to dry food and clothes.

In fact solar energy is still being used for these purposes. The more recent passive uses of solar energy is for cooking, heating, cooling and for the day lighting of homes and buildings.

Active use of solar energy

- ❖ Active solar heating and cooling systems rely on solar collectors which are usually mounted on roofs.
- ❖ Such systems also requires pumps and motors to move the fluids or blow air by fan in order to deliver the captured heat.
- ❖ A number of different active solar heating systems are available. The main application of these systems is to provide hot water, primarily for domestic use.

Solar cells or photovoltaic technology

- ❖ **Solar energy** can be converted directly into electrical energy (direct current, DC) by photovoltaic (PV) cells commonly called solar cells.
- ❖ **Photovoltaic cells** are made of **silicon** and other materials. When sunlight strikes the silicon atoms it causes electrons to eject. This principle is called as 'photoelectric effect'.
- ❖ A typical solar cell is a transparent wafer that contains a very thin semiconductor.
- ❖ Sunlight energizes and causes electrons in the semiconductor to flow, creating an electrical current.
- ❖ With reference to technologies for solar power production, consider the following statements:
- ❖ '**Photovoltaics**' is a technology that generates electricity by direct conversion of light into electricity, while 'Solar Thermal' is a technology that utilizes the Sun's rays to generate heat which is further used in electricity generation process.
- ❖ **Photovoltaics** generates Alternating **Current** (AC), while Solar Thermal generates Direct Current (DC).
- ❖ India has manufacturing base for Solar Thermal technology, but not for **Photovoltaics**.

Photoelectric effect = When light strikes on a material, electrons are dislodged [photons dislodge electrons].

Photovoltaic = The dislodged electrons if channeled through a conductor will create electric current (voltage Or potential difference) = Solar Panels. [Electric current is nothing but movement of electrons from high potential to low potential area (more electrons to less electrons region)]

Solar thermal = converting light into heat = solar cooker, solar water heater.

Photovoltaics generate **direct current (DC)**. [Rotating = AC, Stationary = DC. Electric generator, wind turbine generate AC while solar panels generate DC]

Solar thermal is mostly used for water heating purposes. Electricity can be generated by using hot water steam to rotate turbine = AC current.

Tidal energy

- ❖ Tidal power projects attempt to harness the energy of tides as they flow in and out.
- ❖ The main criteria for a tidal power generation site are that the mean tidal range must be greater than 5 metres.
- ❖ The tidal power is harnessed by building a dam across the entrance to a bay or estuary creating a reservoir.
- ❖ As the tide rises, water is initially prevented from entering the bay. Then when tides are high and water is sufficient to run the turbines, the dam is opened and water flows through it into the reservoir (the bay), turning the blades of turbines and generating electricity.
- ❖ Again when the reservoir (the bay) is filled, the dam is closed, stopping the flow and holding the water in reservoir when the tide falls (ebb tide), the water level in the reservoir is higher than that in the ocean.
- ❖ The dam is then opened to run the turbines (which are reversible), electricity is produced as the water is let out of the reservoir.
- ❖ The dams built to harness the tidal power adversely affect the vegetation and wildlife.

Hydropower Energy

- ❖ Hydroelectric power uses the kinetic energy of moving water to make electricity.
- ❖ Generation of electricity by using the force of falling water is called hydroelectricity or hydel power. It is cheaper than thermal or nuclear power.
- ❖ Dams are built to store water at a higher level; which is made to fall to rotate turbines that generate electricity.
- ❖ One of the greatest advantages of hydropower is that once the dam is built and turbines become operative, it is relatively cheap and clean source of energy.
- ❖ Hydropower also has some disadvantages, building of dam seriously disturbs and damages the natural habitats and some of them are lost forever.

Ministry of New and Renewable Energy (MNRE)

The ministry was established as the Ministry of **Non-Conventional Energy Sources** in 1992. It adopted its current name in October 2006.

The Ministry is mainly responsible for research and development,, intellectual property protection, and international cooperation, promotion, and coordination in renewable energy sources such as wind power, small hydro, biogas, and solar power.

Aim

To develop and deploy new and renewable energy for supplementing the energy requirements of India.

WIND ENERGY

Wind energy is a form of **solar energy**. Wind energy (or wind power) describes the process by which wind is used to generate **electricity**. **Wind turbines** convert the kinetic energy in the wind

into mechanical power. A generator can convert mechanical power into electricity. **Mechanical power** can also be utilized directly for specific tasks such as pumping water.

Wind is caused by the **uneven heating** of the **atmosphere by the sun**, variations in the **earth's surface, and rotation of the earth**. Mountains, bodies of water, and vegetation all influence wind flow patterns. **Wind turbines** convert the energy in wind to electricity by rotating **propeller-like blades around a rotor**. The rotor turns the drive shaft, which turns an electric generator.

The amount of land required for a wind farm varies considerably, and is particularly dependent on two key factors: the desired size of the wind farm (which can be defined either by installed capacity or the number of turbines) and the characteristics of the local terrain.

Typically, **wind turbine** spacing is determined by the rotor **diameter** and **local wind** conditions. Some estimates suggest spacing turbines between 5 and 10 rotor diameters apart. If prevailing winds are generally from the same direction, turbines may be installed 3 or 4 rotor diameters apart (in the direction perpendicular to the prevailing winds); under multi-directional wind conditions, spacing of between 5 and 7 rotor diameters is recommended

More than **54 GW** of clean **renewable wind power** was installed across the **global market** in 2016. Wind power penetration levels continue to increase, led by **Denmark** pushing **40%**, followed by **Uruguay, Portugal and Ireland** with well over **20%**, Spain and Cyprus around 20%, Germany at 16%; and the big markets of China, the US and Canada get 4, 5.5, and 6% of their power from wind, respectively. GWEC's rolling five year forecast sees almost 60 GW of new wind installations in 2017, rising to an annual market of about 75 GW by 2021, to bring cumulative installed capacity of over 800 GW by the end of 2021.

Under National Wind Resource Assessment programme, Ministry through National Institute of Wind Energy, **Chennai** (erstwhile Centre for Wind Energy Technology (C-WET)) and **State Nodal Agencies** had installed and monitored 794 dedicated **Wind Monitoring Stations (WMS)** of height ranging from 20 m to 120 m (20m, 25m, 50m, 80m, 100m & 120m) throughout the country as on 31.12.2014. Initially the wind monitoring was carried out only in known windy areas. Now it is extended to new/ uncovered areas which are not explored in earlier projects to complete the Indian **Wind resource mapping**. Further hundreds of private winds monitoring stations are also operational in the country. Based on the analysis on the data collected from these 700 plus WMS, it is found that 237 stations have economically preferable wind power potential greater than 200 W/m².

The Potential for wind power generation for grid interaction has been estimated at about **1,02,788 MW** taking sites having wind power density greater than 200 W/sq. m at 80 m hub-height with 2% land availability in potential areas for setting up wind farms @ 9 MW/sq. km.

A total capacity of **22,465 MW** has been established up to December, 2014, mainly in **Tamil Nadu, Gujarat, Maharashtra, Andhra Pradesh, Karnataka and Rajasthan**. Wind electric generators of unit sizes between 225 kW and 2.1 MW have been deployed across the country. India now ranks 5th in the world after China, USA, Germany and Spain in grid connected wind power installations. A cumulative total of over 179 billions units of electricity have been fed to the State Electricity Grids up to March, 2014.

Nuclear energy

Nuclear energy is the energy stored in the **nucleus of an atom**. It can be used to produce **electricity**. But, before it can be used, it must be released. The **enormous** energy that is stored in the bonds that hold atoms together can be released by **two processes: nuclear fission or nuclear fusion**. In **nuclear fission**, atoms are split to form smaller atoms, releasing energy whereas in nuclear fusion atoms are combined or fused to form a larger atom. This is how the sun produces energy.

Although nuclear technology is mainly used for the production of electricity in nuclear power plants, this is not the only utility that can be given.

This type of energy appears in many other aspects of our everyday life and in science.

The **radio-isotopes** produced from **nuclear power** reactors are used for radiation **sterilisation** of medical products, production of radio-pharmaceuticals, nuclear medicine and cancer treatment.

The **radio-isotopes** are also used for production of improved varieties of seeds in agriculture, radiation processing of food items like spices, onions, potatoes, and mangoes.

Radiation technologies developed in **Bhabha Atomic Research Centre (BARC)** have also been used for various industrial applications like radiography, detecting leakage points in long natural gas pipelines, tracking petroleum pipelines, for assisting dredging operations in ports, **gamma ray** densitometers, radiography cameras and blood irradiators.

The **isotopes** are used to determine the exact amounts of polluting substances and places in which they occur and their causes. Furthermore, the treatment beam electrons reduces the environmental and health consequences of large-scale employment of fossil fuels, and has a better contribution compared with other techniques, solving problems such as the "**greenhouse effect**" and **acid rain**.

Unmanned spacecraft rely on **radioisotope thermoelectric generators (RTGs)** for the power they need for space exploration. RTGs use heat from plutonium to generate electricity. The craft use this electricity to run the computers that control their operation and collect and process the vast amounts of data, including images that are sent back to Earth.

Nuclear desalination uses the excess heat from a nuclear power plant to evaporate sea water and to condense the pure water.

In India, nuclear energy development began with the objective of peaceful uses of atomic energy in improving the quality of life of the people and to achieve self-reliance in meeting the energy needs.

Institutions involved in Nuclear energy Development

India's Atomic Energy Commission (AEC) was established in **August 1948** within the **Department of Scientific Research**, which was set up in **June 1948**. The **Department of Atomic Energy (DAE)** came into existence in **August 1954** through a **Presidential Order**. Thereafter, a **Government Resolution in 1958** transferred the **DAE** within the **AEC**. The Secretary to the **Government of India in the DAE** is the ex-officio Chairman of the AEC. The other Members of the AEC are appointed on the recommendation of the Chairman of the AEC

DAE's own Research & Development wings include:

- 1) **Bhabha Atomic Research Centre (BARC), Trombay:** A series of 'research' reactors and critical facilities was built here. Reprocessing of used fuel was first undertaken at Trombay in 1964.
- 2) **Indira Gandhi Centre for Atomic Research (IGCAR):** IGCAR at **Kalpakkam** was set up in 1971.
- 3) **Atomic Minerals Directorate:** The DAE's Atomic Minerals Directorate for Exploration and Research (AMD) is focused on mineral exploration for uranium and thorium. It was **set up in 1949**, and is based in Hyderabad, with over 2700 staff.

HAZARD

Hazard is a threat. A hazard is a dangerous physical condition or event. Earthquakes, floods, volcanic eruption, landslides, droughts etc. are called natural hazards before they cause great loss of life and damage to property. It may cause injury, loss of life or damage of property. Earthquakes, floods, volcanoes, tsunami, land slide, drought etc. are natural hazards.

What is vulnerability?

Vulnerability may be defined as "The extent to which a community, structure, services or geographic area is likely to be damaged or disrupted by the impact of particular hazard, on account of their nature, construction and proximity to hazardous terrains or a disaster prone area." Vulnerabilities can be categorized into physical and socio-economic vulnerability. Disasters occur when hazards meet vulnerability.

Disaster

Disaster is an event. It is a calamity or tragedy or a consequence of a hazard. Natural hazards that cause great loss to human life and economy are called disasters and catastrophes. A disaster disrupts the normal function of the society. It causes damage to property and loss of life but it also disrupts the opportunities of employment.

A **natural hazard** is a natural phenomenon that might have a negative effect on humans or the environment. Natural hazard events can be classified into two broad categories: **geophysical and biological**. **Geophysical hazards** encompass geological and meteorological phenomena such as earthquakes, volcanic eruptions, wildfires, cyclonic storms, floods, droughts, avalanches and landslides. Biological hazards can refer to a diverse array of disease, infection, infestation and invasive species.

Many geophysical hazards are related; for example, submarine earthquakes can cause tsunamis, and hurricanes can lead to coastal flooding and erosion. Floods and wildfires can result from a combination of geological, hydrological, and climatic factors. It is possible that some natural hazards are inter temporally correlated as well. An example of the distinction between a natural hazard and a natural disaster is that the 1906 San Francisco earthquake was a disaster, whereas living on a fault line is a hazard. Some natural hazards can be provoked or affected by anthropogenic processes (e.g. land-use change, drainage and construction).

Geological hazards

Avalanche: An avalanche occurs when a large snow (or rock) mass slides down a mountainside. An avalanche is an example of a gravity current consisting of granular material. In an avalanche, lots

of material or mixtures of different types of material fall or slide rapidly under the force of gravity. Avalanches are often classified by the size or severity of consequences resulting from the event.

Earthquake: An earthquake is the sudden release of energy stored as lithospheric stress that radiates seismic waves. At the Earth's surface, earthquakes may manifest with a shaking or displacement of the ground; when the earthquake occurs on the seafloor, the resulting displacement of water can sometimes result in a tsunami.

Coastal erosion: Coastal erosion is a physical process by which shorelines in coastal areas around the world shift and change, primarily in response to waves and currents that can be influenced by tides and storm surge. Coastal erosion can result from long-term processes (see also beach evolution) as well as from episodic events such as tropical cyclones or other severe storm events.

Lahar: A lahar is a type of natural event closely related to a volcanic eruption, and involves a large amount of material originating from an eruption of a glaciated volcano, including mud from the melted ice, rock, and ash sliding down the side of the volcano at a rapid pace. These flows can destroy entire towns in seconds and kill thousands of people, and form flood basalt. This is based on natural events.

Landslide: A landslide is a mass displacement of sediment, usually down a slope. It can be caused by pressure pulling natural objects down a declining hill.

Sinkhole: A sinkhole is a localized depression in the surface topography, usually caused by the collapse of a subterranean structure such as a cave. Although rare, large sinkholes that develop suddenly in populated areas can lead to the collapse of buildings and other structures.

Volcanic eruption: A volcanic eruption is the point in which a volcano is active and releases its power, and the eruptions come in many forms. They range from daily small eruptions which occur in places like Kilauea in Hawaii, to **megacolossal eruptions** (where the volcano expels at least 1,000 cubic kilometers of material) from **supervolcanoes** like Lake Taupo (26,500 years ago) and Yellowstone Caldera.

Meteorological or climate hazards

Blizzard: A blizzard is a severe winter storm with icy and windy conditions characterized by low temperature, strong wind and heavy snow.

Drought: A drought is a period of below-average precipitation in a given region, resulting in prolonged shortages in the water supply, whether atmospheric, surface water or ground water. Scientists warn that global warming and climate change may result in more extensive droughts in coming years. These extensive droughts are likely to occur within the African continent due to its very low precipitation levels and high temperatures.

Hailstorm: A hailstorm is a natural hazard where a thunderstorm produces numerous hailstones which damage the location in which they fall. Hailstorms can be especially devastating to farm fields, ruining crops and damaging equipment.

Heat wave: A heat wave is a hazard characterized by heat which is considered extreme and unusual in the area in which it occurs. Heat waves are rare and require specific combinations of weather events to take place, and may include temperature inversions, katabatic winds, or other

phenomena. There is potential for longer-term events causing global warming, including stadial events (the opposite to glacial "ice age" events), or through human-induced climatic warming.

Cyclonic storm: Cyclone is a large scale air mass that rotates around a strong center of low atmospheric pressure.

Hurricane Katrina: Hurricane, tropical cyclone, and typhoon are different names for the cyclonic storm system that forms over the oceans. It is caused by evaporated water that comes off of the ocean and becomes a storm. The Coriolis effect causes the storms to spin. 74 mph (119 km/h). Hurricane is used for these phenomena in the Atlantic and eastern Pacific Oceans, tropical cyclone in the Indian, and typhoon in the western Pacific.

Ice storm: An ice storm is a particular weather event in which precipitation falls as ice, due to atmosphere conditions. It causes damage.

Tornado: A tornado is a natural disaster resulting from a thunderstorm. Tornadoes are violent, rotating columns of air which can blow at speeds between 50 mph (80 km/h) and 300 mph (480 km/h), and possibly higher. Tornadoes can occur one at a time, or can occur in large tornado outbreaks associated with super cells or in other large areas of thunderstorm development. Waterspouts are tornadoes occurring over tropical waters in light rain conditions.

Geomagnetic storm: Geomagnetic storms can disrupt or damage technological infrastructure, and disorient species with magnetoreception.

Flood: A flood results from an overflow of water beyond its normal confines of a body of water such as a lake, or the accumulation of water over land areas.

Wildfire: Wildfire is a fire that burns in an uncontrolled and unplanned manner. Wildfires can result from natural occurrences such as lightning strikes or from human activity.

Disease: Disease is a natural hazard that can be enhanced by human factors such as urbanization or poor sanitation. Disease affecting multiple people can be termed an outbreak or epidemic. In some cases, a hazard exists in that a human-made defense against disease could fail, for example through antibiotic resistance.

Multi-hazard analysis: Each of the natural hazard types outlined above have very different characteristics, in terms of the spatial and temporal scales they influence, hazard frequency and return period, and measures of intensity and impact. These complexities result in "single-hazard" assessments being commonplace, where the hazard potential from one particular hazard type is constrained. In these examples, hazards are often treated as isolated or independent. An alternative is a "multi-hazard" approach which seeks to identify

International campaigns

In 2000, the United Nations launched the International Early Warning Programme to address the underlying causes of vulnerability and to build disaster-resilient communities by promoting increased awareness of the importance of disaster risk reduction as an integral component of sustainable development, with the goal of reducing human, economic and environmental losses due to hazards of all kinds (UN/ISDR, 2000).

The 2006-2007 United Nations International Disaster Reduction Day theme was “Disaster reduction education begins in school”. The Foundation of Public Safety Professionals launched an international campaign with an international open essay or documentary competition.

DISASTER IN INDIA

India is vast and diverse in terms of its physical and socio-cultural attributes. It is largely due to its vast geographical area, environmental diversities and cultural pluralities, India is struggling with disasters from many years. Its vastness in terms of natural attributes combined with its prolonged colonial past, continuing various forms of social discriminations and also equally large population have enhanced its vulnerability to natural disasters. Killer waves (tsunami) struck the coastal parts of India on 26th December 2004 or the morning of 26th January 2001, when western part of India was badly affected by earthquake or recent flashflood in the Uttarakhand or Cyclone Phalin at Odisha coast. These are just few examples.

What is Mitigation?

Mitigation is the effort to reduce loss of life and property by lessening the impact of disasters. In order for mitigation to be effective we need to take action now—before the next disaster—to reduce human and financial consequences later (analyzing risk, reducing risk, and insuring against risk). It is important to know that disasters can happen at any time and any place and if we are not prepared, consequences can be fatal.

Effective mitigation requires that we all understand local risks, address the hard choices, and invest in long-term community well-being. Without mitigation actions, we jeopardize our safety, financial security and self-reliance.

The Mitigation Strategy: Goals, Actions, Action Plan

The mitigation strategy is made up of three main required components: mitigation goals, mitigation actions, and an action plan for implementation. These provide the framework to identify, prioritize and implement actions to reduce risk to hazards.



Mitigation goals are general guidelines that explain what the community wants to achieve with the plan (see figure above). They are usually broad policy-type statements that are long-term, and they represent visions for reducing or avoiding losses from the identified hazards.

Example goal: Minimize new development in hazard-prone areas.

Mitigation actions are specific projects and activities that help achieve the goals.

Example action: Amend zoning ordinance to permit only open space land uses within floodplains.

The action plan describes how the mitigation actions will be implemented, including how those actions will be prioritized, administered and incorporated into the community's existing planning mechanisms. In a multi-jurisdictional plan, each jurisdiction must have an action plan specific to that jurisdiction and its vulnerabilities.



Although not required, some communities choose to develop objectives to help define or organize mitigation actions (see figure above). Objectives are broader than specific actions, but are measurable, unlike goals. Objectives connect goals with the actual mitigation actions.

International Efforts

- Recognizing the deleterious effects of ozone depletion, an international treaty, known as the **Montreal Protocol, was signed at Montreal (Canada) in 1987** (effective in 1989) to control the emission of ozone depleting substances.

Vienna Convention for the Protection of the Ozone Layer

- Multilateral Environmental Agreement.
- It was agreed upon at the **Vienna Conference of 1985** and entered into force in 1988.
- It acts as a framework for the international efforts to protect the ozone layer.
- However, it does not include legally binding reduction goals for the use of CFCs, the main chemical agents causing ozone depletion. These are laid out in the accompanying Montreal Protocol.

Montreal Protocol

- The Montreal Protocol on Substances that Deplete the Ozone Layer (a protocol to the Vienna Convention for the Protection of the Ozone Layer) is an international treaty designed to protect the ozone layer by **phasing out** the production of numerous substances that are responsible for ozone depletion.
- It was **agreed in 1987**, and entered into **force in 1989**, followed by a **first meeting in Helsinki, May 1989**. Since then, it has undergone eight revisions.
- As a result of the international agreement, the ozone hole in Antarctica is slowly **recovering**.
- Climate projections indicate that the ozone layer will return to 1980 levels between 2050 and 2070.
- It is the single most successful international agreement to date.

The **two ozone treaties** (**Vienna Convention and Montreal Protocol**) have been ratified by 197 parties [196 UN states + European Union] making them the first universally ratified treaties in United Nations history.

UN Framework Convention on Climate Change is also ratified by 197 parties

UNCED – Earth Summit 1992, Rio De Janeiro Brazil

Earth Summit 1992 is also known as **The United Nations Conference on Environment and Development (UNCED)**.

As a follow-up, the **World Summit on Sustainable Development (Rio+10)** was held in **2002 in Johannesburg, South Africa**.

190 countries pledged their commitment to achieve by **2010**, a significant reduction in the current rate of **biodiversity loss at global, regional and local levels**.

In **2012**, the **United Nations Conference on Sustainable Development** was also held in **Rio**, and is also commonly called **Rio+20** or **Rio Earth Summit 2012**.

Agenda 21

Agenda 21 is an action plan of the **United Nations (UN)** related to sustainable development.

It was an outcome of the **United Nations Conference on Environment and Development (UNCED)** held in **Rio de Janeiro, Brazil, in 1992**.

The number 21 refers to an agenda for the 21st century.

UN Framework Convention on Climate Change (UNFCCC), 1992

- Aim: Stabilize GHG emissions, adopt CBDR approach to sustainable development.
- **Year of ratification:** 1993 (agreement signed by India in 1992)
- **Implementation in India:** Working groups constituted by THE Ministry of Environment and Forests (MoEF), NATCOM (National Communication) prepared by the Government, with GHG inventory being duly communicated. Other measures include Establishment of the Technology Information, Forecasting and Assessment Council under the Department of Science and Technology, and formulation of the Participatory Forest Management Strategy of the Government of India

Basel Convention on Trans-boundary Movement of Hazardous Wastes, 1989

Aim: Reduce trans-boundary movement and creation of hazardous wastes

Year of ratification: **1992**

Implementation: The Indian Hazardous Wastes Management Rules Act 1989 provides a statutory framework to give force to this MEA.

Convention on Biological Diversity, 1992

Aim: Addressing biodiversity conservation and sustainable usage, habitat preservation, and protection of indigenous people's rights, and intellectual property.

Implementation: Wildlife (Protection) Act, 1972 enacted.

UNFCCC: United Nations Framework Convention on Climate Change

- ❖ International environmental treaty that came into existence under the aegis of UN.
- ❖ **Signed** ==> May 1992.
- ❖ **Location** ==> New York City, USA.
- ❖ As of **March 2014**, UNFCCC has **196** parties (almost all countries).
- ❖ **UNFCCC** is negotiated at the United Nations Conference on Environment and Development (UNCED).
- ❖ UNCED is informally known as the **Earth Summit 1992**, held in Rio de Janeiro, Brazil.
- ❖ **Role:** UNFCCC provides a framework for negotiating specific international treaties (called "protocols") that aim to set binding limits on greenhouse gases.
- ❖ **Objective of UNFCCC:** Stabilize greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous consequences.
- ❖ **Legal Effect:** Treaty is considered legally non-binding: The treaty itself set no binding limits on greenhouse gas emissions for individual countries.

Conferences of the Parties (COP) – UNFCCC

The COP is the supreme decision-making body of UNFCCC. All States that are Parties to the Convention are represented at the COP. They review the implementation of any legal instruments that the COP adopts. They promote the effective implementation of the Convention. The first COP meeting was held in **Berlin, Germany in March, 1995**. The parties to the convention have met annually since 1995.

In **1997, the Kyoto Protocol (3rd COP)** was concluded and established legally binding obligations for developed countries to reduce their greenhouse gas emissions. The 2010 Cancun agreements stated that future global warming should be limited to below 0 °C (3.6 °F) relative to the pre-industrial level.

- ❖ The 21st COP (2015) was held in Paris in 2015.
- ❖ The 22nd COP (2016) will be held at Marrakesh, Morocco.

List of UNFCCC Summits

- ❖ *1995: COP 1, The Berlin Mandate*
- ❖ *1996: COP 2, Geneva, Switzerland*
- ❖ *1997: COP 3, The Kyoto Protocol on Climate Change*
- ❖ *1998: COP 4. Buenos Aires, Argentina*
- ❖ *1999: COP 5, Bonn, Germany*
- ❖ *2000: COP 6. The Hague. Netherlands*
- ❖ *2001: COP 6, Bonn. Germany*
- ❖ *2001: COP 7. Marrakech, Morocco*
- ❖ *2002: COP 8, New Delhi, India*
- ❖ *2003: COP 9, Milan, Italy*
- ❖ *2004: COP 10. Buenos Aires. Argentina*
- ❖ *2005: COP 11/CMP 1. Montreal, Canada*
- ❖ *2006: COP 12/CMP 2, Nairobi. Kenya*
- ❖ *2007: COP 13/CMP 3, Bali, Indonesia*
- ❖ *2008: COP 14/CMP 4, Poznan. Poland*
- ❖ *2009: COP 15/CMP 5, Copenhagen, Denmark*
- ❖ *2010: COP 16/CMP 6, Cancun, Mexico*
- ❖ *2011: COP 17/CMP 7, Durban, South Africa*
- ❖ *2012: COP 18/CMP 8, Doha, Qatar*

- ❖ **2013: COP 19/CMP 9, Warsaw, Poland**
- ❖ **2014: COP 20/CMP 10. Lima, Peru**
- ❖ **2015: COP 21/CMP 11, Paris, France**
- ❖ **2016: COP 22/CMP 12, Marrakech, Morocco**

Kyoto Protocol

The **Kyoto Protocol** was adopted in **Kyoto, Japan, in 1997**. India ratified Kyoto Protocol in **2002**. The Kyoto Protocol came into **force in February 2005**. There are currently 192 Parties. **USA never ratified Kyoto Protocol**. **Canada withdrew in 2012**.

Goal: Fight global warming by reducing greenhouse gas concentrations in the atmosphere to “a level that would prevent dangerous anthropogenic interference with the climate system.”

Kyoto protocol aimed to cut emissions of greenhouse gases across the developed world by about 5 per cent by 2012 compared with 1990 levels. The Protocol is based on the principle of common but differentiated responsibilities. Kyoto Protocol is the only global treaty with binding limits on GHG emissions.

It puts the **obligation** to reduce current emissions on **developed countries** on the basis that they are historically responsible for the current levels of **greenhouse gases** in the atmosphere.

CBDR divides countries into two categories.

Historically biggest polluting developed countries like US, UK, France, Japan, Russia etc. (they are polluting the earth since Industrial Revolution). Recently polluting developing countries like China, India, Brazil, etc. (polluting since 1950s).

“**Common**” = Every country (both developing and developed) must take part in the fight against climate change. “**But differentiated responsibilities**” = historically biggest polluters should do more compared to the recent polluters = Responsibilities proportional to pollution caused. So under **CBDR**, developed countries like US, UK, Russia etc. must contribute more to reduce GHGs (greenhouse gases).

PARIS AGREEMENT

- ❖ The **Paris Agreement** was adopted by **185 nations in December 2015**.
- ❖ India had signed the agreement in **New York in April 2016**.
- ❖ So far, **191** countries have signed the agreement.
- ❖ It officially entered into force after **55 parties** to the convention accounting for at least 55% of total GHG (greenhouse gas) emissions ratified it
- ❖ **India** was **62nd** country to ratify it.

❖ **Paris Agreement** gives thrust to the global actions to address **climate change** and pertains to post-2020 climate actions. In the pre-2020 period, developed countries are to act as per **Kyoto Protocol** and some developing countries have taken voluntary pledges.

What are the outcomes of Paris Climate talks?

❖ **Commitment** to reduce **emissions** to limit rise of temperature well beyond 2 degree and trying for 1.5 degree

❖ **Five year** review mechanism to check progress on nationally declared goals (INDCs)

❖ Funding to the tune of additional 1 million USD per year in GCF up till 2020, further establishing a mechanism.

❖ The agreement also includes a provision requiring developed countries to send \$100 billion annually to their developing counterparts beginning in 2020. This figure is expected to increase with time.

❖ The agreement gives countries considerable leeway in determining how to cut their emissions but mandates that they report transparently on those efforts. Every five years nations will be required to assess their progress towards meeting their climate commitments and submit new plans to strengthen them. Some elements in the agreement are binding-like reporting requirements.

Salient Features:

❖ The **Paris Agreement** acknowledges the development imperatives of developing countries. The Agreement recognizes the developing countries' right to development and their efforts to harmonize development with environment, while protecting the interests of the most vulnerable.

❖ The **Paris Agreement** recognizes the importance of sustainable lifestyles and sustainable patterns of consumption with developed countries taking the lead, and notes the importance of 'climate justice' in its preamble

❖ The objective of the Agreement further ensures that it is not mitigation-centric and includes other important elements such as adaptation, loss and damage, finance, technology, capacity building and transparency of action and support

What is International Solar Alliance?

International Solar Alliance or ISA consists of **121 countries**. ISA consists of most of those countries which are located between the **tropic of cancer and tropic of Capricorn**. These countries are located at the shortest distance from the Sun that is why solar energy is available in these quantities throughout the year. The **ISA** has set a target of 1 TW of solar energy by **2030**.

What are the objectives of International Solar Alliance?

1. The purpose of the International Solar Alliance is to bring such **countries** (which are located between the Tropics of Cancer and Capricorn) on a **platform** that supports clean energy, sustainable environment, clean public transport and clean climate.
2. This alliance wants to overcome the obstacles in the way of **promoting solar energy**.
3. **ISA** will promote the development and use of solar energy in order to provide energy security to present and future generations.

4. ISA's goal is to generate 1 trillion watt (**1000 gigawatt**) of solar power by **2030**.

How many countries are included in the International Solar Alliance?

The ISA is open to **121** prospective member countries, most of them located between the Tropics of Cancer and Capricorn as this is the region worldwide with a surplus of bright sunlight for most of the year.

ISA; has become one of the largest organizations in the world and **61 countries** have signed the ISA Framework Agreement within **2 years** from its commencement.

What is the role of India in the International Solar Alliance?

International Solar Alliance (ISA) is the first international organization that has secretariat in **India**. ISA will increase the stature of India at the international level. Addressing the conference on **March 11, 2018**, Prime **Minister Modi** said that "India; aims to produce 100 gigawatt solar energy (which will be one-tenth of ISA's target) by 2022." India will produce 175 GW of electricity from renewable sources.

Indian Renewable Energy Development Agency (IREDA) and Solar Energy Corporation of India (SECI) announced contribution of US \$ 1 million each to the ISA corpus fund. It is expected that if this organization succeeds in achieving its goals, it will not only be the source of clean fuel for the current generation, but will also meet the needs of future generations.

Ramsar Convention

The Ramsar Convention on Wetlands of International Importance especially as Waterfowl Habitat is an international treaty for the conservation and sustainable use of wetlands. It is also known as the Convention on Wetlands. It is named after the city of Ramsar in Iran, where the Convention was signed in 1971.

Every three years, representatives of the Contracting Parties meet as the Conference of the Contracting Parties (COP), the policy-making organ of the Convention which adopts decisions (Resolutions and Recommendations) to administer the work of the Convention and improve the way in which the Parties are able to implement its objectives. The most recent COP12 was held in Punta del Este, Uruguay, in 2015. COP13 will take place in Dubai, United Arab Emirates, in October 2018.

IMPORTANT TERMS RELATED TO ENVIRONMENT

The Air (Prosecution & Control of Pollution) Act, 1981: this act controls and regulates emissions from automobiles and industrial plants

The forest conservation Act, 1980: it mainly prohibits the state government from declaring any reserve forest as non-reserve without approval of the central authority.

Environment Protection Act, 1986: it lays down the standards for emission and discharge of pollutants, restricting areas for certain industries and laying down the safeguards for prevention.

National Green Tribunal (NGT): the tribunal was established on 18 October 2010 under the national green tribunal act 2010 for effective and expeditious disposal of cases related to environmental protection and conservation of forests and other natural resources.

Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), 1973:

The objective is to control international commercial trade in endangered species or products derived from them.

Basel Convention, 1989: The main aim is to minimize transboundary movement of hazardous wastes.

UN Framework Convention on Climate Change (UNFCCC), 1992: The main aims are to stabilize emission of greenhouse gases and to check reasons for global warming and climate change.

Chipko Movement: it was started in 1973 in Chamoli district Uttarakhand. It entailed embracing the trees upon seeing an axe coming near the tree to cut it. Its main leader was Shri Sunderlal.

UNIT-10

HIGHER EDUCATION SYSTEM

Introduction to higher education:-

Higher education provides people with an opportunity to reflect on the critical, social, economic, cultural, moral and spiritual issues facing humanity. It contributes to the national development through dissemination of specialized knowledge and skills. It is therefore, a crucial factor for survival. Being at the apex of the educational pyramid, it also has a key role in producing teachers for the educational system. Higher Education is a key element in demographic dividend and also that it intends to make optimum utilization of human resources specifically in age group of 15-95 years.

Formal education system can be categorized into three, namely primary, secondary and tertiary education. Tertiary education is a wider term; it is higher education plus vocational education. According to the perspective of the NET paper I focus is on higher education.

Secondary education begins to expose students to the varied roles of science, humanities, and social sciences and also to vocational streams. This is also an appropriate stage to provide children with a sense of history and national perspective and give them opportunities to understand their constitutional duties and rights as citizens. Board of Secondary Education plays the main role in importing this education. Elementary or primary education adopts a child-centered approach. It continues up to 14 years. There are three principle levels of qualification in higher education:

1. Undergraduate level leading to bachelors'
2. Postgraduate level leading to master degree
3. Research level leading to Ph.D. Fellowship, or Post doctorate

Evolution of Higher Education System in India:

'Education during the Vedic age was a journey from mortality to immortality, from chaos to spiritual bliss'.

Ancient education system has been very wide in India. In ancient times, there were two education systems, such as **'Vedic and Buddhist'**. The *Vedic system refers to Vedas, the six Vedangas (Phonetics, Ritualistic knowledge, Grammar, Exegetics, Metrics and astronomy), Upanishads, the six Darshanas (Nyaya, Vaisheshika, Sankhya, Yoga, Mimamsa and Vedanta) Puranas (History), Trka shastra (Logic). Sanskrit was the medium of instruction in Vedic system.*

Knowledge was passed on orally from one generation to another in ancient India. Basically, education involved the comprehension of three basic stages involved in the process:

- ❖ **SRAVANA:** stage of acquiring knowledge of 'Shrutis' by listening.
- ❖ **MANANA:** Meaning pupils to think, analyze themselves about what they heard, assimilate the lessons taught by their teacher and make their own inferences.
- ❖ **NIDIDHYASANA:** Meaning comprehension of truth and apply it into real life.

Knowledge was divided into two broad streams as given below:

- ⇒ **The Paravidya:** the higher knowledge & the spiritual wisdom.
- ⇒ **The Aparavidya:** the lower knowledge and the secular sciences.

There was a high standard of learning for women also. In house, they might learn music and dancing. They had to undergo the Upanayana ceremony. There were two classes of educated women as stated below.

1. **Sadyodwahas:** they are people who prosecuted studies till their marriages.
2. **Brahmavadinis:** they are people who did not marry and pursued studies throughout their lives.

The word Veda means knowledge and are NITYA (routine). They are basic in life and four in number:

1. **Rig veda:** it is the earliest work of all Indo-European language and humanity that comprises 'Plain Living' and 'high thinking'. Gayatri Mantram that is also found in Sama Veda and Yajur Veda touch the highest point of knowledge and sustain human souls to this day. The Rig veda is a collection of 1028 hymns.
2. **Sama veda:** the Sama veda is a collection of verses from the Rig Veda for liturgical purposes. Liturgical is participation of people in the work of god.
3. **Yajur veda:** it is the collection of prose mantras, through the duty of chanting the hymns on the occasion of sacrifice was mainly undertaken by the Hotri, the first order of priesthood.
4. **Post vedic** education also continued with three types of institutions namely Gurukulas, Parishads (academies) and sammelans (conferences)

BUDDHIST EDUCATION

Lord Buddha realized the necessity of education for devotees at large. There was expansion of education. Nalanda & Takshila developed into universities of international importance. The main subjects or topics of study in Buddhist system of education were three Pitakas (SUTTA, VINAYA & ABHIDHANNA).

The art of writing was known very well in India. In Jaina, works like Samavaya Sutra and Pragnapara Sutra reference to 18 different scripts are available.

Vocational Education

Ancient Indian literature refers to 64 professions or arts which includes weaving, dyeing, spinning, art of tanning leather, manufacture of boats, chariots, the art of training elephants and horses, the art of making jewels and so on.

Knowledge was imparted orally. Itihas (history), Anviksiki (logic), Mimamsa (interpretation), shilpashastra (architecture), Arthashastra (polity), varta (agriculture, trade and commerce), etc could be termed as the main subjects

Types of Teachers:

- ❖ **ACHARYA:** A teacher to teach Vedas without charging fee from the students.
- ❖ **UPADHYAYA:** To earn his livelihood and taught only a portion of the Vedas.
- ❖ **CHARAKAS:** Wandering scholars to visit the nation for higher knowledge, usually regarded as possible source of knowledge by Satapatha Brahmana.
- ❖ **YAUJANASATIKA:** They were famous for their profound scholarships, students from distant places would visit to seek education.

Educational Institutions:

- ❖ **Gurukul:** was the house of the teacher who was a settled house-holder.
- ❖ **Parishads:** here, the students usually settle for higher education, they were originally conducted by three Brahmins. The number gradually increased, even a Parishad consisted of twenty Brahmins who were well versed in philosophy, theology and law. Sangam was also such Parishad during 1st century CE in Tamilnadu, here some works were submitted for criticism also.

- ❖ **Goshti:** or conferences was a national gathering summoned by a great king in which representatives of various schools were invited to meet and exchange their views.
- ❖ **Ashramas:** or hermitages were another center where students from distant and different parts of the country flocked together for learning around famous sages and saints.
- ❖ **Vidyapeeta:** was an educational institution for spiritual aspects started by the great Acharya. Sri Shankara started such institutions.
- ❖ **Ghathikas:** here, both the teachers and the pupils met and discussed. The cultured scholars would meet, discuss and clash also.
- ❖ **Agraharas:** were settlements of Brahmins in villages where they used to teach.
- ❖ **Mathas:** they were mainly for residing and receiving religious and secular instructions. These mathas belonged to both Shaiva & Vaishnava sects and were normally attached to some temple associations.

Main Educational Institutions of Higher Education During Ancient India

1. **TAXILA:** Taxila was the capital of **Gandhar Kingdom**. Taxila has been described as the 1st university established across the globe in 7th century BCE. **Hiuen Tsang** in his records mentioned the University of Taxila to be at par with **Nalanda** and **Vikramshila** universities.

Taxila was an important centre of **Brahmanical** education, it maintained its stature even during the Buddhism in Northern India. It has attracted many students from other nations.

Taxila University was famous for medical studies. Panini, the well-known grammarian, **Kautila**, the minister of **Chandragupta Maurya** and **Charaka**, a medical teacher of repute had been part of it.

There was no popularly organized institution or university. Admission of the students as per decision of the teacher, though they were taught subjects as per choice. Usually, the minimum age was more than sixteen years.

There was no exam system, so there were no degree or diploma. The main branches were Vedatrayi (three vedas), Vedanta, Vyakaran, military education etc.

2. **NALANDA (Bihar):** it is located near **Rajgriha** in the province of **Bihar**, it has been the birth place of **Sariputta**, a favourite disciple of Lord **Buddha**, who is closely linked with Mahayana. It was a Buddhist centre of learning from 427 CE to 1197 CE. It has been known as one of the first great universities in recorded history.

It is stated that at one time there were 10,000 monks staying at **Nalanda**. Of these, 1510 were teachers and the remaining 8500 were students belonging to various levels of attainments and studying various subjects.

Its real importance begins with the year 450 CE. Then it was important for three centuries. **Hiuen Tsang** came here in 7th century CE. It progressed a lot during Gupta dynasty. In year 2010, Nalanda University was set up in Bihar as a central university.

3. **VALABHI:** Hiuen Tsang has found **Valabhi** in the western side of India as glorious as Nalanda. It was not just a centre of religious education as of other secular subjects such as Arthashastra, Niti Shastra and **Chikitsa** were also taught here.

4. **VIKRAMSHILA:** It was set up and established by the Emperor Dharmapala of Pal dynasty in the 8th century in Northern Magadh on the bank of the river Ganges. This university was famous for religious teachings and here 108 scholars were appointed as the incharge and Acharyas of the various temples. Mahasthavir was the highest authority of the University, being known as the Kulpati of the Gurukula.

5. **ODANTAPURI:** This University had been established long before the Kings of Pala dynasty came into power in Magadha. Odantpuri could not attain that level of fame and repute which either Nalanda has accomplished.

6. **JAGADDALA:** Pal King, Raja Ram Pal of Bengal constructed a monastery and named it as Jagaddala. It remained as the center of Buddhist education for about 100 years. It was again destroyed during invasion in 1203 CE.
7. **MITHILA:** In the Upanishadic age, Mithila became a prominent seat of Brahmanical education. It was named as Videha. It continued with its glory from Raja Janak upto Buddhist period. Famous poet Vidyapati, who has written in Hindi and Jaideo, a prominent poet of Sanskrit literature was born here.
8. **NADIA:** Situated at the confluence of Ganga and Jalangi rivers in Bengal, it was formerly called Navadweep. Education in Nadia University was imparted at three centres namely Vavadweep, Shantipur and Gopaalpara.
9. **UJJAIN:** It was famous for its secular learning including mathematics and astronomy.

Key Developments of Modern Education System:

CHARTER ACT (1813):- The **Charter Act** brought to an end the era of agitation started by Charles Grant, Wilberforce and others. **It allowed the missionaries to land in India in large numbers and establish modern English schools and thereby they laid the foundation of the well-organised modern educational system.**

The Charter Act recognised educational development in India under the guidance and control of three distinct agencies, viz.:

- ❖ the missionary enterprise,
- ❖ non-official enterprise, both European and Indian and
- ❖ Official enterprise.

The missionary enterprise is also regarded as non-official enterprise. During the period 1813 – 33 education under official enterprise did not make much headway. The progress was not much appreciable. It was slow and tardy because education had been passing through an experimental stage. Official educational efforts and non-official enterprises (missionary) went hand in hand.

The Charter Act opened the shores of India to missionary societies. As a result, the period from **1813 to 1833** was one of great mission activity in different parts of the Company's possessions. The earlier missionary societies expanded their activities and new societies entered the field.

Of these latter societies special mention may be made of the General Baptist Missionary Society, the London Missionary Society, the Church Missionary Society, the Wesleyan Mission and the Scotch Missionary Society.

ELPHINSTONE REPORT (1823):- It recommended the appointment of district Examination officers, School supervisors, and training to teachers. Elphinostone Institution was set up in 1834 in Bombay which marked the beginning of new developments in the field of higher education. It is one of the oldest colleges of Bombay University.

MACAULAY'S MINUTES (1835):-

Lord Macaulay came to **India in June 10, 1834**, as the law member of the **Governor General's Executive council** and was appointed as the **President of the committee** of Public Instruction. He was entrusted to settle down the dispute between orientalists and Anglicists in **1835**. He submitted his famous minutes in **February, 1835** to the council which was approved by **Lord Bentik** and a resolution was passed in **March 1835**.

The following points were emphasized which are given below:

1. The great object of the British Government ought to be the promotion of European literature and Science amongst the natives of India that "all funds appropriated for the purpose of education would be best employed on English education alone".
2. "All the existing professors and students at all the institutions under the superintendence of the committee shall continue to receive the stipends but no stipend shall be given to any students that may hereafter enter at any of these institutions".
3. "The Government Funds were not to be spent on the printing of oriental works".
4. "All the funds at the disposal of the Government would be henceforth be spent in imparting to the Indians a knowledge of English literature and Science"

WOOD DISPATCH (1854):- Sir Charles Wood, the President of the Board of Control, had an important effect on spreading English learning and **female education in India**. When in 1854 he sent a despatch to Lord Dalhousie, the then **Governor-General of India**. Wood suggested that primary colleges must adopt **vernacular languages**, high schools must adopt **Anglo vernacular language** and on college level English medium for education. This is known as **Wood's despatch**. Vocational and **women's education** were not stressed upon. One of the most favourable steps taken by **EIC** was to create English class in Indian people to be used as workforce in company's administration. the British had done best developmental activities during this phase it was the final phase where British get social reforms after this period they will not get any social reforms.

He recommended there in that:

- ❖ **English education** will increase moral character in Indian's mind and thus supply EIC with civil servants who can be trusted upon.
- ❖ An education department was to be set up in every province.
- ❖ Universities on the model of the London University be established in big cities such as **Bombay, Calcutta and Madras**.
- ❖ At least one government school be opened in every district.
- ❖ Affiliated private schools should be given grant in aid.
- ❖ The Indian natives should be given training in their mother tongue also.
- ❖ Provision was made for a systematic method of education from primary level to the university level.
- ❖ The government should always support education for women.
- ❖ The medium of instruction at the primary level was to be vernacular while at the higher levels it would be English

HUNTER COMMISSION (1882-1883):-

Hunter Education Commission was a landmark commission appointed by **Viceroy Lord Ripon** with objectives to look into the complaints of the non-implement of the **Wood's Despatch of 1854**; the contemporary status of **elementary education** in the British territories; and suggest means by which this can be extended and improved. This commission, headed by **Sir William Wilson Hunter**, had submitted its report in **1882**.

Recommendations of Hunter Commission

The Hunter Commission brought out the neglect to the primary and secondary education in the country and recommend that the responsibility for the Primary Education must be given to the Local Boards and Municipal Boards. Its important recommendations were as follows:

Encouragement to Primary Education: The commission found that primary **education** in the British Indian territories is lagging behind and some part of the provincial revenues must be reserved for

financing the development of primary education in British Indian territories. The elementary schools should be handed over to the management of municipal councils and district boards and other bodies subject to inspection and supervision by government.

Secondary Education: The **Hunter Commission** reported that the secondary education was making commendable progress, particularly in **Bengal**, where the system of Grants-in-aid worked well. At that time, there were two private schools for every one government school. The commission recommended that the secondary schools should be progressively handed over to the private enterprises, which should be encouraged in the form of grants-in-aid. However, standard of the education should not be permitted to decline.

UNIVERSITIES COMMISSION (1902):- Lord Curzon was the first person to appoint a commission on university education. On **January 27, 1902**, the Indian Universities Act, 1904- India University Commission was appointed under the Chairmanship of Sir Thomas Raleigh to enquire into conditions and prospects of the universities established in British India and to consider and report upon the proposals of the universities established in British India and to consider and report upon the proposals for improving their constitution and working. The Indian Universities Act of 1904, passed on March 21 was formulated on the basis of the recommendations of the India University commission of 1902.

NATIONAL COUNCIL OF EDUCATION:-

The **National Council of Education (or NCE)** was an organisation founded by **Indian nationalists in Bengal in 1906** to promote science and technology as part of a swadeshi industrialisation movement. It established the **Bengal National College** and Bengal Institute which would later merge to form **Jadavpur University**. Institutions functioning under the Council were considered to be hotbeds of swadeshi activities and the government banned nationalistic activities such as the singing of patriotic song.

RESOLUTION ON EDUCATIONS POLICY (1913):- This policy recommended that a university should be established for each province the teaching activities of universities should be encouraged, and that the colleges located in Mofussil towns should be developed into teaching universities in due course.

SADDLER COMMISSION (1917):- It is also popular as the Calcutta University commission.

1. It recommended the separation of intermediate education from Degree College and suggested a special selection committee for selection of university teachers.
2. Calcutta university commission suggested the setting up of Central Advisory Board of Education (CASE) CABE was set up in **1920** but was abolished in **1993** due to financial crisis.
3. Under the **Government of India Act, 1919** education was made a provincial subject so as to minimize the control of central government in the education system.

HARTOG COMMITTEE (1929):-

In 1929, the **Hartog Committee** submitted its report. This Committee was appointed to survey the **growth of education in British India**. It "devoted far more attention to mass education than Secondary and University Education". The committee was not satisfied with the scanty growth of literacy in the country and highlighted the problem of 'Wastage' and 'Stagnation' at the primary level.

It mentioned that the great waste of money and efforts which resulted because of the pupils leaving their schools before completing the particular stage of education. Its conclusion was that "out of every **100 pupils (boys and girls)** who were in **class I in 1922-23, only 18 were reading in class IV in 1925-26**. Thus resulted in a relapse into illiteracy. **So, it suggested the following important measures for the improvement of primary education.**

- ❖ Adoption of the policy of consolidation in place of **multiplication** of schools;
- ❖ Fixation of the duration of primary course to four years;

- ❖ Improvement in the quality, training, status, pay, service condition of teachers;
- ❖ Relating the curricula and methods of teaching to the conditions of villages in which children live and read;
- ❖ Adjustment of school hours and holidays to seasonal and local requirements;
- ❖ Increasing the number of Government inspection staff.

SAPRU COMMITTEE:- the committee appointed in **1934** by the United province (largely present Uttar Pradesh) Government to enquire into the causes of unemployment in U.P came to the conclusion that the system of education commonly prevalent prepared pupils only for examination and degrees and not for any avocation in life.

ABBOT WOOD REPROT (1937):-

The absence of adequate and proper vocational education was being felt in India and the public was raising its demand for it since long. Therefore, the **Government of India** invited in **1936-37 two British** experts to come **India** and prepare a plan for **vocational education** in the country. **These two experts were A. Abott and S.H. Wood.**

These two persons toured in **Punjab, Delhi and U.P** and prepared a report on **vocational education within four months**. This report was neither comprehensive nor successful. On the basis of this report the **Sargent Report of 1944** was published.

The **Sargent Report** presented a more detailed plan of vocational education than the **Abott Report** did. However, the latter one cannot be ignored, as it has its own importance. Below we give a brief summary point wise of this report:

- ❖ **Vocational education** should be organized according to the needs of various vocational areas. No vocational area should be considered less important.
- ❖ In the organization of **vocational education** the main regional vocations should be especially considered.
- ❖ **Vocational education** should be considered at par with literary and science education and its standard should be raised.
- ❖ Vocational education should be considered as complementary to other types of education.
- ❖ For general and vocational education there should be separate schools, as the purpose of the two is different.

WARDHA SCHEME OF EDUCATION (1937):-

On July 31, 1937, Gandhi had published an article in the **Harijan**. Based upon this article, an all **India National Education Conference** was held on **October 22 and 23, 1937**. The conference is called **Wardha Educational Conference** and the president of this conference was Gandhi himself.

Resolution at Wardha Conference:

- ❖ Free and **compulsory** education to be provided **for 7 years** at a nationwide scale.
- ❖ Mother tongue should be the medium of instruction.
- ❖ Throughout this period of 7 years, the education should be around some forms of manual and productive work and for this purpose a handicraft must be chosen , based upon the environment of the child.
- ❖ This system would generate the remuneration of the teachers.

Basic Education Committee under **Dr. Zakir Hussain** Following **Wardha conference**, a committee under **Dr. Zakir Hussain** was appointed to formulate the scheme of the basic education. The aim of the basic education was to develop the qualities of the ideal citizenship and more aspect should be give to the Indian culture than the literacy. There should be **NO PLACE** for **English** in the curriculum. There was no place for religious education in this scheme. The most important point was the economic goals of the basic education, which would develop by the manual handicraft of the

children for a period of **7 years**. This was not accepted by **Muslim League**, for religious education was of utmost importance.

SARGENT REPORT (1944):-

The **Sergeant Plan** was worked out by the **Central advisory board of education in 1944**. Recommendation of **Sargeant plan** of Education 1944

Preprimary education for the **3-6** age group, free, universal and compulsory elementary education for **6-11** year age, high school education for **11-17** year age group for selected children, and a university course of 3 year after the higher secondary high schools to be of **two types**:

- ❖ Academic
- ❖ Technical and Vocational
- ✓ Adequate technical, commercial and Arts education.
- ✓ Abolition of intermediate course.
- ✓ Liquidation of adult illiteracy in 20 year.

Stress on **teacher training, physical education, education** for the physically and mentally handicapped. The **objective** was to create within **40 Years** the same levels of educational attainment as prevailed in England. Although a bold and comprehensive scheme, it proposed no methodology for implementation. Also the ideal of England's achievement may not have suited Indian conditions.

HIGHER EDUCATION AFTER INDEPENDENCE: - Government of India took several initiatives to improve and promote higher education in the country after independence.

RADHAKRISHNAN COMMISSION (1948-1949):-

As an academic, philosopher, and statesman, **Sarvepalli Radhakrishnan (1888-1975)** was one of the most recognized and influential Indian thinkers in academic circles in the 20th century.

The **Radhakrishnan** was named chairman of the **University Education Commission**. After Independence the first action of a great significance to be taken by the Government of India in the field of education was the appointment of the University Education Commission under the Chairmanship of **Dr. S. Radhakrishnan**, a distinguished scholar and former Vice-Chancellor of Banaras University, who rose to become the second President of India.

After independence on **August 15, 1947**, **Radhakrishnan** was requested to Chair the **University Education Commission**. The **Radhakrishnan Committee's** suggestions helped would the education system for India's needs to report on Indian University Education and suggest improvements and extensions that may be desirable to suit present and future requirements of the country" The **Commission's 1949** Report assessed the state of university education and made recommendations for its improvement in the newly independent India. The Commission held its first meeting in New Delhi on **6th December, 1948**, when the **Hon'ble Maulana Abul Kalam Azad**, Minister for Education, Government of India, addressed the meeting and explained Governments' intentions in regard to the purpose and scope of the inquiry.

MUDALIAR COMMISSION (1952-1953):-

The **Secondary Education commission** known as **Mudaliar Commission** was appointed by the government of India in term of their Resolution to bring changes in the present education system and make it better for the Nation. **Dr. A. Lakshmanswami Mudaliar** was the Vice-Chancellor of **Madras University**.

After the Independence India needed a change in the education system. Number of Secondary Schools were increasing in India it was much a need to take care the students of secondary school.

Aim of Appointment:

1. To enquire into the problems of Secondary Education
2. The aims, organization & content of secondary education and

3. Its relationship to Primary & Higher Education

Suggest measures for its reorganization and with particular reference to:

- ❖ Its relationship to primary, basic and higher education.
- ❖ The aims, organization and content of education.
- ❖ The inter-relation of Secondary Schools and different types
- ❖ Other allied problem so that a sound and reasonably uniform system of Secondary Education suited to our needs and resources may be provided for the whole country.

COMMITTEE ON EMOTIONAL INTEGRATION (1961):- It was set up under the chairmanship of **Dr. Sampurnanand** to study the role of educational programmes for youth, in general and students in schools and colleges, in particular in order to strengthen the process of emotional integration.

KOTHARI COMMISSION (1964-1966):-

Chairman: **Dr D.S.Kothari**, the then **Chairman of University Grants Commission**. The third commission in post-independent India. Government Resolution setting up the Education Commission on **July 14, 1964** & it began its task on **October 2, 1964** and submitted its report to the Government on **June 29, 1966**. Report entitled- Education and National Development **17members** in which 5 foreign experts from countries such as USA, U.K, USSR, France and Japan.

MAJOR RECOMMENDATIONS

1) AIMS OF EDUCATION

Education should be related to the life, needs and aspirations of the people so that the national objectives may be achieved.

(a) Education for increasing productivity

- ❖ Make science education an integral part of school course.
- ❖ Work experience
- ❖ Vocational education to meet the needs of industry, commerce, agriculture etc.
- ❖ Improvement of scientific and technical education and research at the university stage.

(b) Education for social and national integration

- ❖ Common school system
- ❖ Social service programmes
- ❖ Teaching of languages, literature, philosophy and history of India.

(C) Education for modernization

- ❖ Adopting new methods of teaching.
- ❖ Proper development of intrinsic attitudes and values and building essential skills like independent training.
- ❖ Emphasizing teaching of vocational subjects and science.

(d) Development of Democracy

- ❖ The success of democracy depends on the enlightened citizenship and enlightened citizenship is based on the education of the masses. Education is the most powerful instrument to make the people aware of their rights and responsibilities.

(e) Cultivation of social, moral and spiritual values

- ❖ Education system should emphasize the development of fundamental, social, moral and spiritual values.
- ❖ The commission recommended the study of major religions of the world.

2) EDUCATIONAL STRUCTURE AND STANDARD

- ❖ General education should last for a period of 10 years. (4 years lower primary, 3 years of higher primary and 3 years of lower secondary education).
- ❖ Prior to general education, pre-primary education should also be given.
- ❖ The theme of higher secondary education should be fixed for 2 years.

- ❖ After degree course there should be a post graduate course of three years. The graduate course should be extended from two to three years.
- ❖ The number of instructional days in a year should be increased to about 234 (39 weeks) for schools and 216 (36 weeks) for colleges and pre-primary schools.
- ❖ Holidays should be minimized. No need to close an educational institution on a religious holiday.

3) TEACHER STATUS

- ❖ It is necessary to improve the economic, social and professional status of the teachers.
- ❖ The scale of pay of teachers of Government and non-Government schools should be the same.
- ❖ A State Board of Teachers' Education should be established in each state.
- ❖ The period of training of teachers with secondary course should be two years. The course of **M.Ed** should be 1-1/2 years.
- ❖ The Teachers of the training colleges should have two degrees namely, the Master's Degree and Degree in Education
- ❖ The students of the training institutions should be given free education

EDUCATION SUBJECT IN CONCURRENT LIST (1976):- India has a federal setup and education is the concurrent responsibility of both the centre as well of states. Post-independence, education (including university education) was the responsibility of the states, while the centre was given the function of coordination and determination of standards. However, in 1976, through Entry 25 (42nd list of the constitutional Amendment) in the concurrent list of the responsibility along with the states for all levels of education.

SAM PITRAODA COMMITTEE (1917):- It was set up in 2007. It is also popularly known as national knowledge commission (NKC). It recommended restructuring of curricula to meet the demand for multidisciplinary professionals and criteria based resource allocation to ensure maintenance of standards and strategic preferences to promote excellence in higher education.

YASHPAL COMMITTEE:- It suggested scrapping of all higher education, regulatory or monitoring bodies and creation of a super regulator, that is a seven member commission for higher education and Research (CHER). State Higher Education councils would form the second tier of the system. It also recommended that the deemed university statues be abandoned and that all deserving deemed varsities be either converted into full-fledged universities or scrapped. The committee stressed the need for more attention to undergraduate and a multidisciplinary approach to learning. Yashpal Committee also strongly recommended reducing the burden of affiliation of colleges on the universities and a GRE like test be evolved for university education.

SHARMA COMMITTEE:- Set up under Prof MM Sharma, it deliberated upon the development of science and technology education in India. The committee suggested establishment of India Institute of Science, Education, and Research (IISER). It also recommended expansion of technical education, assuring quality and providing access and affordability for technical education.

National Policy on Education (NPE) is a policy formulated by the Government of India to promote education amongst India's people. The policy covers elementary education to colleges in both rural and urban India. The first NPE was promulgated in 1968 by the government of Prime Minister Indira Gandhi, and the second by Prime Minister Rajiv Gandhi in 1986.

The government of India has appointed a new committee under K. Kasturirangan to prepare a Draft for the new National Education Policy in 2017.

Recent Developments

1. District Primary Education Program (DPEP)
2. Sarva Shiksha Abhiyan (SSA)/Right to Education (RTE)
3. National Programme for Education of Girls at Elementary Level (NPEGEL)

4. Rashtriya Madhyamik Shiksha Abhiyan (RMSA) for development of secondary education, launched in 2009.
5. Inclusive Education for the Disabled at Secondary Stage (IEDSS IEDSS)
6. Saakshar Bharat (Saakshar Bharat)/Adult Education
7. Rashtriya Uchchatar Shiksha Abhiyan (RUSA) for development of higher education, launched in 2013.
8. National Policy on Education 2016: Report of the Committee for Evolution of the New Education Policy.

ORTHODOX, CONVENTIONAL & NON-CONVENTIONAL EDUCATION:

Orthodox education: knowledge was passed on orally from one generation to another as per orthodox education. Even now education is being imparted in orthodox manner.

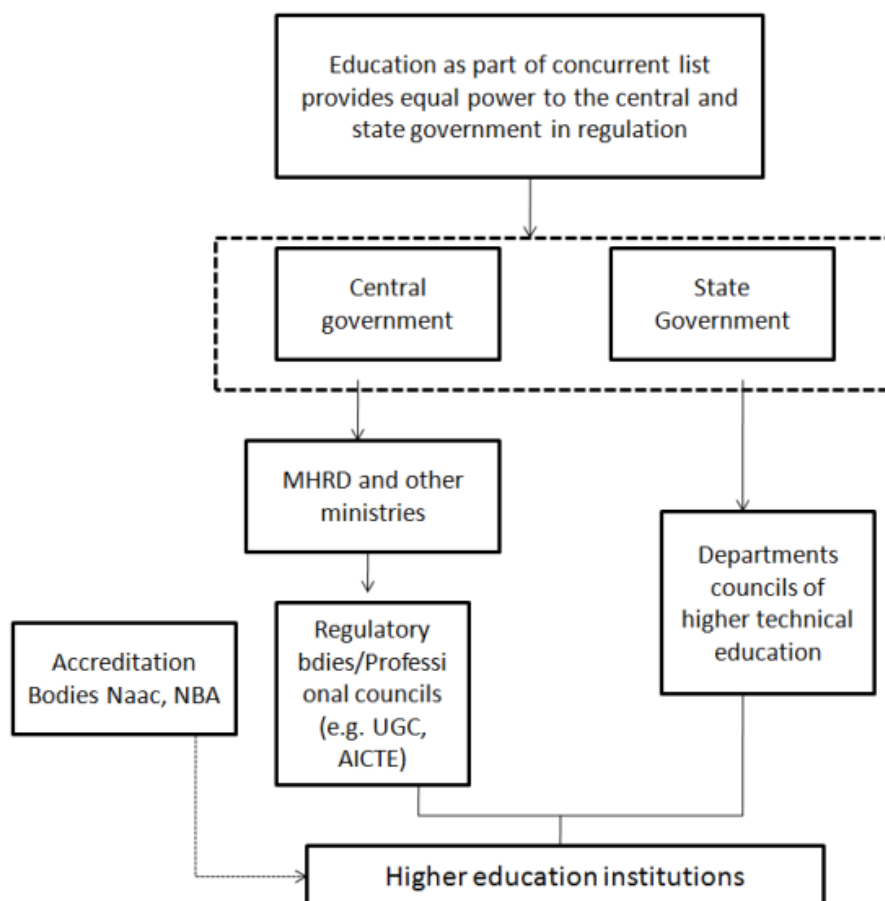
Orthodox education involved three basic processes, in which it included 'Śravaṇa' (stage of acquiring knowledge of 'Śrutis' by listening). Second- 'Manana' (meaning pupils to think, analyse themselves about what they heard, assimilate the lessons taught by their teacher and make their own inferences). Third- 'Nidhyasana' (meaning comprehension of truth and apply it into real life).

Conventional & Non-conventional Education: Teaching activity in the system of combination of conventional & non-conventional training can be safely treated as innovative creative activity. Most of the teachers have worked for a considerable part of their teaching life in a conventional school. Thus, the system of conventional & developing training is perceived as a certain innovation.

The new general-education system needs a teacher of a new type where the main goal is not to deliver knowledge to pupils but organize an independent activity of the pupils designed to master the methods of analysis and generalization of the teaching material. The combination of conventional & non-conventional education considerably enriches interpersonal communication between the students and the teacher, which positively affects the results of training & the personality of the students. Every learner is involved into training & organizing activity implemented through communication. The learners are encouraged and blamed in a benevolent atmosphere of communication.

REGULATORY AND POLICY FRAMEWORK STRUCTURE OF HIGHER EDUCATION IN INDIA:-

Education is in concurrent list where both central and state governments can legislate.



REGULATORY FRAMEWORK OF HIGHER EDUCATION IN INDIA

While the center coordinates and determines the standards in higher and technical education, school education is primarily the responsibility of the state. The key policy making agencies for higher education are as follows.

- 1. Central government:-** It lays down the national Policy on Education. It provides grants of the UGC and establishes central Universities/Institution of national importance in the country. It is also responsible for declaring an educational on the recommendation of the UGC.
- 2. State government:-** many states have also set up councils and advisory boards to provide guidelines for proper functioning of higher education institution in the states. State councils for higher education coordinates the roles of government universities, and apex regulatory agencies in higher education within the state.
- 3. Central advisory board of education (CABE)** was set up for coordination and cooperation between the union and the states in the field of education including policy making.

APEX LEVEL BODIES: - There are eight Apex Level Bodies (Regulatory Bodies/Research Councils) under the Department of Higher Education, which are responsible for higher education in India. These bodies can be broadly divided into two categories

- (i) **Regulatory Bodies and**
- (ii) **Research Councils.**

REGULATORY BODIES:- There are three regulatory Bodies- University Grants commission, all India council for technical Education, and council of Architecture – to regulate higher education in India.

UNIVERSITY GRANTS COMMISSION:-

UGC governs universities in India and came into existence on **28 December 1953**. It became a statutory organization established by an **act of Parliament in 1956**.

1. According to section 12 of UGC Act, the main function of UGC is coordination, determination and maintenance of standards in universities
2. It also disburses funds within the university education system. Most importantly, it only acts as a commendatory body since it does not have any power to establish or derecognize any university.
3. UGC consists of the chairman, vice chairman, and 10 other members appointed by the central government. Secretary is the Executive Head. It is functional from New Delhi as well as its six regional offices located in Bangalore, Bhopal, Guwahati, Hyderabad, Kolkata and Pune.
4. UGC also implements various schemes aimed at improving the quality of higher education like **Universities with Potential for Excellence (UPE)**, **colleges with Potential for Excellence (CPE) centre with potential for excellence and a particular Area (CPEPA)** **special assistance Programme (SAP)** **Basic scientific research (BSR)**, etc.
5. **Dr C.D Deshmukh was the first chairman of UGC.**

NATIONAL TESTING AGENCY

- **National Testing Agency (NTA)** has been established as a premier, specialist, autonomous and self-sustained testing organization to conduct entrance examinations for admission/fellowship in higher educational institutions.
- To assess competence of candidates for admissions and recruitment has always been a challenge in terms of matching with research based international standards, efficiency, transparency and error free delivery. The National Testing Agency is entrusted to address all such issues using best in every field, from test preparation, to test delivery and to test marking.

VISION NTA

The right candidates joining best institutions will give India her demographic dividend.

MISSION

To improve equity and quality in education by administering research based valid, reliable, efficient, transparent, fair and international level assessments. The best subject matter experts, psychometricians and IT delivery and security professionals will ensure that the current gaps in existing assessment systems are properly identified and bridged.

CORE VALUES

NTA will create a system which will promote teaching (by teachers), learning (by students) and assessment (by parents and institutions). NTA strongly believes in quality, efficiency, effectiveness, equity and security of assessments. To practice these values, NTA will constantly engage with its stakeholders, viz. students, parents, teachers, experts and partner institutions.

OBJECTIVES

- ✚ To conduct efficient, transparent and international standards tests in order to assess the competency of candidates for admission, and recruitment purposes.
- ✚ To undertake research on educational, professional and testing systems to identify gaps in the knowledge systems and take steps for bridging them.
- ✚ To identify experts and institutions in setting examination questions.
- ✚ To produce and disseminate information and research on education and professional development standards.

FUNCTIONS

- ✚ To identify partner institutions with adequate infrastructure from the existing schools and higher education institutions which would facilitate conduct of online examinations without adversely impacting their academic routine.
- ✚ To create a question bank for all subjects using the modern techniques
- ✚ To establish a strong R&D culture as well as a pool of experts in different aspects of testing

✚ To help individual colleges and universities in the field of testing and to provide training and advisory services to the institutions in India. To provide quality testing services to the academic institutions in India.

✚ To develop a state of the art culture of testing in India by using domestic and international expertise. To collaborate with international organizations like ETS to achieve the same.

✚ To undertake any other examination that is entrusted to it by the Ministries/Departments of Government of India/State Governments.

✚ To undertake the reforms and training of school boards as well as other bodies where the testing standards should be comparable with the entrance examinations.

TEAM NTA

NTA will have a team of education administrators, experts, researchers and assessment developers who believe that scientifically designed and properly delivered assessments can improve teaching learning processes in Indian class rooms. Students coming out of these processes will immensely contribute to the wellbeing of our country. These assessments will also improve equity and will ensure that merit and not the means prevail in selections.

NTA will emphasize on updating its practices by constant innovation in assessment. The organization will give major emphasis to research in evaluation and use that research to update its assessment practices.

CORE TEAM MEMBERS

- ✚ Test Item Writers
- ✚ Researchers and Psycho-metricians
- ✚ Education Specialists

A) RESEARCHERS AND PSYCHOMETRICIANS

NTA has **six operational verticals** pertaining to various examinations. Every vertical will employ about 6 researchers including internationally known experts of psychometrics and statistics.

The group of researchers will be responsible for the following-

- ✚ Research and analysis of data to support the examinations they are entrusted with
- ✚ Ideate for future assessment practices
- ✚ Establish good assessment practices and influence policy at the national level

The group of psycho=metricians and statisticians will be responsible for the following-

- ✚ Reliability of the test in different versions to be used
- ✚ Validity of the test by showing that the test measures the knowledge or skills that it is intended to measure
- ✚ Fairness of the test by ensuring that no group of students is either advantaged or disadvantaged due to medium of examination or content of the questions
- ✚ Equating multiple tests that will be done during a year so that these tests become comparable

NTA will set professional standards for assessments in the country, research on education and professional development.

Since **India** is a hugely diverse country, **NTA** will effectively liaise with various state governments, universities, state education boards, UGC, **AIU, NCTE, NCERT, CBSE, CISCE**, NIOS etc. to understand student's abilities and higher education institution's requirements.

B) TEST ITEM WRITERS

NTA will create a pool of highly professional subject matter experts who will be trained by the psycho=metricians and statisticians. These subject matter experts will write items for NTA and using

software/ artificial intelligence, the NTA will create tests. **Initially, the tests of NTA will come under the following categories:**

ENTRANCE EXAMINATIONS

- ✚ JEE (Main)
- ✚ NEET – UG
- ✚ CMAT
- ✚ GPAT

ASSESSMENTS FOR FELLOWSHIP

- ✚ UGC - NET

TARGETED ASSESSMENTS

In future, NTA will also undertake other tests to measure specific population's content, knowledge and skills.

EDUCATION POLICY SPECIALISTS

NTA will have a huge repository of data of student performance, with various other demographic parameters across subject areas. NTA will analyse this data to inform the policymakers about the corrective measures required for improving teaching and learning.

NTA will, inter alia, report on-

- ✚ in-depth analysis of educational achievement across States and achievement gap
- ✚ teacher quality and certification
- ✚ Time series comparison of performance across states
- ✚ Inputs on student and teacher training needs
- ✚ educational reform

CATEGORIZATION OF UNIVERSITIES:

Universities can be set up only through legislation or the deemed route. At present the main constituents of universities of university level institutions are listed below.

Universities Number

- ✚ 47 Central Universities
- ✚ 1 Central/ national Open University
- ✚ 13 State Open Universities
- ✚ 74 Institutes of National Importance (INI)
- ✚ 290 state public universities
- ✚ 5 institute under state legislature act
- ✚ 123 deemed-to-be universities
- ✚ 260 Private Universities

Did you know?

- ✚ There are no universities in Andaman & Nicobar Islands, Dadra & Nagar Haveli, Daman & Diu and Lakshadweep
- ✚ The maximum number of universities are in Uttar Pradesh (59), followed closely by Tamil Nadu (56) and Andhra Pradesh (47)
- ✚ Goa only has two universities.
- ✚ The number of students enrolled in universities/ colleges for higher education is more than 2.9 crores (2,96,29,022 to be exact) out of which 1.6 crores are boys and 1.3 crores are girls.
- ✚ 11.9 percent of these students study through distance education.
- ✚ The Gross Enrolment Ratio (GER) in higher education in India is currently 21.1.
- ✚ The states with the most number of colleges (in descending order) are Uttar Pradesh, Andhra Pradesh, Maharashtra, Karnataka, Rajasthan, Tamil Nadu and Madhya Pradesh.

The **Pupil Teacher Ratio (PTR)** in higher education (universities & colleges) is 23 i.e. there is one teacher for 23 students.

Common terms one may come across in terms of educational institutes in India:

- ❖ Central Universities
- ❖ State Universities
- ❖ Deemed to be Universities
- ❖ Private Universities
- ❖ Autonomous Colleges

Central universities in India are established by an Act of Parliament and are under the purview of the Department of Higher Education in the **Union Human Resource Development Ministry**. In general, universities in India are recognized by the **University Grants Commission (UGC)**, which draws its power from the University Grants Commission Act, 1956. Central universities, in addition, are covered by the Central **Universities Act, 2009**, which regulates their purpose, powers, governance etc., and established 12 new universities. The list of central universities published by the UGC lists **49 central universities, as of 12 December 2018**, nine of which are directly funded by the Government of India and are not under the purview of the UGC. There are 49 central universities under the purview of MHRD. Out of them, 16 new central universities were established in 2009 by an Act of parliament, namely Central Universities Act, 2009.

State universities are run by the state government of each of the states and territories of India, and are usually established by a **local legislative assembly act**.

Deemed university, or "**Deemed-to-be-University**", is a status of autonomy granted by the Department of Higher Education on the advice of the UGC, under Section 3 of UGC Act, 1956.

Private universities are approved by the **UGC**. They can grant degrees but they are not allowed to have off-campus affiliated college.

An **autonomous university** typically refers to a university that exercises independent control over its day-to-day operations and curriculum. It is generally associated with universities or institutions and implies that the sponsoring state does not have control over academic matters of the school. Conversely, universities that are not autonomous generally have their academic programs and/or curriculum controlled and even dictated by the state's Ministry of Education or government agency regulating higher education.

A **VIRTUAL UNIVERSITY** provides higher education programs through **electronic media**, typically the **Internet**. Some are **bricks-and-mortar** institutions that provide online learning as part of their extended university courses while others solely offer online courses. They are regarded as a form of **distance education**. The **goal of virtual universities is to provide access to the part of the population who would not be able to attend a physical campus, for reasons such as distance**—in which students live too far from a physical campus to attend regular classes; and the need for flexibility—some students need the flexibility to study at home whenever it is convenient for them to do so.

The **unitary universities** have a single **campus** and largely concentrate on **postgraduate studies and research**, though some may also have provision for undergraduate programs, e.g., **Aligarh Muslim University, Banaras Hindu University, Jawaharlal Nehru University**. **Some of the unitary universities have also colleges under them known as university colleges or constituent colleges.**

Subject Universities: While most of the “deemed universities” and “institutions of national importance” deal with specific subjects, there is now a new trend of establishing subject-oriented universities in various States. To begin with, one agricultural university was established in each State. All colleges of agriculture, forestry, veterinary and animal husbandry, and home science affiliated to

different universities in the State, were transferred to this university as its constituent colleges. The number of agricultural universities is 28.

OPEN UNIVERSITY: The **Department of Higher Studies of Ministry of Human Resource and Development (MHRD)** defines Open and Distance Learning as a system “wherein teachers and learners need not necessarily be present either at same place or same time and is flexible in regard to modalities and timing of teaching and learning as also the admission criteria without compromising necessary quality considerations”.

Open Universities are significant for continuing quality education and skill development of persons residing at educationally disadvantageous locations.

Open Universities provide education through open-door **academic policy**, i.e. a system of education wherein admission is granted to the candidates on basis of minimum education and previous academic record, experience or references are not mandatory. These universities follow **no-class room** teaching method, thus their fee is affordable for all-rich, poor, working professionals, non-working people. Another important feature of Open Universities, is that there's no **age** limit as such. Any person from any walk of life at any age can pursue higher education. **Open Universities** function under UGC's purview hence, the degrees and certificates awarded are UGC approved and valid in every regard. **Indira Gandhi National Open University is the largest university in the world in terms of intake, having approximately 3.5 million students across the globe.**

Central Universities by state

The region with the most central universities in India is Uttar Pradesh with six universities, namely Aligarh Muslim University, Babasaheb Bhimrao Ambedkar University, Banaras Hindu University, Allahabad University, Rajiv Gandhi National Aviation University and Rani Lakshmi Bai Central Agricultural University.

There are central universities in all of the states of India except Goa and Andhra Pradesh. Of the union territories, there are central universities in Delhi and Puducherry.

The **President of India is the 'Visitor'** for all the Central Universities in India. The President can nominate some members to **the Executive Committee/Board of Management/Court/Selection Committees** of the University in terms of the various statutes and provisions laid down in the University Act. The **Ministry of Human Resources and Development or MHRD** helps the President to appointment Vice Chancellors, Court Nominees and Selection Committee Nominees.

Visva Bharati University is the only central university which has **PM as its chancellor**. **And all other Central Universities Chancellor is Vice-president except a very few exceptions of respective State Governor.** Usually Chancellor of a central university is the Governor of the state where it's located. However there are many exceptions. In Delhi University it's the Vice- President of India, whereas in JNU and many others it is a distinguished academician/ scientist appointed by the Visitor of the University (President) on the recommendation of the Executive Council of the University.

As per the new UGC (Institutions Deemed-to-be Universities) Regulations 2010, notified on May 21, the chancellor of a deemed university, appointed by the sponsoring society or trust, will have to be an eminent educationist or a distinguished public figure other than the president of the sponsoring society or his/her relative. The chancellor can be a member of neither the society nor the trust.

Distance Education “is a process to create and provide access to learning when the source of information and the learners are separated by time and distance, or both.” In other words, distance learning is the process of creating an educational experience of equal qualitative value for the learner to best suit their needs outside the classroom. **Distance Education Council (DEC)** was an organisation based in New **Delhi**, India responsible for the promotion and coordination of the open university and distance education system and for determination of its standards in India. The Council was constituted under the **Indira Gandhi National Open University Act (1985)**. In **June 2013**,

University Grants Commission has taken over DEC, by establishing Distance Education Bureau which will govern the distance education programs in India. The UGC has constituted a Committee to examine the pending proposals of programme-wise recognition to the institutions.

Indira Gandhi National Open University known as IGNOU, is a Central University located at New Delhi, India. Named after former **Prime Minister of India Indira Gandhi**, the university was established in **1985**. IGNOU was founded to serve the Indian population by means of **distance and open education**, providing higher education opportunities to all segments of society. It also aims to encourage, coordinate and set standards for distance and open education in India, and to strengthen the human resources of India through education. Apart from teaching and research, extension and training form the mainstay of its academic activities. It also acts as a national resource centre, and serves to promote and maintain standards of distance education in India. **IGNOU hosts the Secretariats of the SAARC Consortium on Open and Distance Learning (SACODiL) and the Global Mega Universities Network (GMUNET), initially supported by UNESCO.**

IGNOU has started a decentralisation process by setting up five zones; north, south, east, west and north-east. The first of the regional headquarters, catering to four southern states, Pondicherry, Andaman and Nicobar and Lakshadweep, is being set up in the outskirts of Thiruvananthapuram in Kerala. The Ministry of HRD has entrusted the responsibility of developing Draft Policy on Open and Distance Learning and Online Courses to IGNOU.

Accreditation for higher learning over Universities under the aegis of University Grants Commission is overseen by following fifteen autonomous statutory institutions.

- ❖ All India Council for Technical Education (AICTE)
- ❖ Distance Education Council (DEC) now DEB
- ❖ Indian Council of Agricultural Research (ICAR)
- ❖ Bar Council of India (BCI) LAW
- ❖ Board of Theological Education of the Senate of Serampore College (BTESSC)
- ❖ National Council for Teacher Education (NCTE)
- ❖ Rehabilitation Council of India (RCI)
- ❖ Medical Council of India (MCI)
- ❖ Pharmacy Council of India (PCI)
- ❖ Indian Nursing Council (INC)
- ❖ Dental Council of India (DCI)
- ❖ Central Council of Homoeopathy (CCH)
- ❖ Central Council of Indian Medicine (CCIM)
- ❖ National Council for Rural Institutes (NCRI)
- ❖ State Councils of Higher Education (SCHE)
- ❖ Council of Architecture
- ❖ Veterinary Council of India (VCI)

In a major move in the education sector, the **University Grants Commission (UGC)** on Tuesday **20 March 2018** granted autonomy to as many as 60 institutions for higher education in the country. The list of the institutions that would be given autonomy include five central universities, 21 state universities, 24 deemed universities, two private universities and eight autonomous colleges. An announcement in this regard was made on Tuesday by Union **HRD Minister Prakash Javadekar**, who said that “the government is striving to introduce a liberalized regime in the education sector and emphasis is on linking autonomy with quality.

NAAC

The **National Assessment and Accreditation Council (NAAC)** is an organization that **assesses and accredits higher education Institutions (HEIs)** in India. It is an autonomous body funded by University Grants Commission of Government of India **headquartered in Bangalore.**

NAAC was established in 1994 in response to recommendations of National Policy in Education (1986). This policy was to "address the issues of deterioration in quality of education", and the Programme of Action (POA-1992) laid out strategic plans for the policies including the establishment of an independent national accreditation body. Consequently, the NAAC was established in 1994 with its headquarters at Bengaluru.

The NAAC functions through its General Council (GC) and Executive Committee (EC) comprising educational administrators, policy makers and senior academicians from a cross-section of Indian higher education system. The Chairperson of the UGC is the President of the GC of the NAAC, the Chairperson of the EC is an eminent academician nominated by the President of GC (NAAC). The Director is the academic and administrative head of NAAC and is the member-secretary of both the GC and the EC. In addition to the statutory bodies that steer its policies and core staff to support its activities NAAC is advised by the advisory and consultative committees constituted from time to time.

GER:

GER is a statistical measure for determining the number of students enrolled in undergraduate, postgraduate and research level studies within the country and is expressed as a percentage of the population. Although India aims to attain a GER of 30% by 2020, it's still much behind countries like China, which, currently, boasts an enrolment ratio of 43.39%. USA's GER is 85.8% and Pakistan's is 9.93%.

The Gender Parity Index (GPI) is a socioeconomic index usually designed to measure the relative access to education of males and females. This index is released by UNESCO. In its simplest form, it is calculated as the quotient of the number of females by the number of males enrolled in a given stage of education (primary, secondary, etc.). A GPI equal to one signifies equality between males and females. A GPI less than one is an indication that gender parity favors males while a GPI greater than one indicates gender parity that favors females. The closer a GPI is to one, the closer a country is to achieving equality between males and females. It is used by international organizations, particularly in measuring the progress of developing countries. The Institute for Statistics of UNESCO also uses a more general definition of GPI: for any development indicator one can define the GPI relative to this indicator by dividing its value for females by its value for males.

Inter University Centres (IUCs)

The UGC establishes autonomous Inter-University Centres within the university system under Clause 12(ccc) of the UGC Act. The objectives for setting up these centres are:

1. To provide common advanced centralized facilities/services for universities which are not able to invest heavily in infrastructure and other inputs.
2. To play a vital role in offering the best expertise in each field to teachers and researchers across the country.
3. To provide access for research and teaching community to the state-of-the-art equipment and excellent library facilities which are comparable to international standards.

All India Council for Technical Education (AICTE)

The All India Council for Technical Education (AICTE) is the statutory body and a national-level council for technical education, under Department of Higher Education, Ministry of Human Resource Development. Established in November 1945 first as an advisory body and later on in 1987 given statutory status by an Act of Parliament, AICTE is responsible for proper planning and coordinated development of the technical education and management education system in India. The AICTE accredits postgraduate and graduate programs under specific categories at Indian institutions as per its charter.

It is assisted by 10 Statutory Boards of Studies, namely,

1. UG Studies in Eng. & Tech.,
2. PG and Research in Eng. and Tech.,
3. Management Studies,
4. Vocational Education,
5. Technical Education,
6. Pharmaceutical Education,
7. Architecture,
8. Hotel Management and Catering Technology,
9. Information Technology,
10. Town and Country Planning.

The AICTE has its new headquarters building in Delhi on the Nelson Mandela Road, Vasant Kunj, New Delhi, which has the offices of the chairman, vice-chairman and the member secretary, plus it has regional offices at Kanpur, Chandigarh, Gurgaon, Mumbai, Bhopal, Baroda, Kolkata, Guwahati, Bangalore, Hyderabad, Chennai and Thiruvananthapuram.

In 2016, three important initiatives were taken up by AICTE.

1. First one was a responsibility given by MHRD to evolve a national MOOCs platform SWAYAM.
2. Second one is that of launching a Smart India Hackathon-2017 challenging the young bright talented students of technical colleges to solve the 598 problems of 29 different Government departments.
3. Third one is that of launching of an AICTE's Student Start up Policy by Hon.

National Board of Accreditation (NBA)

The National Board of Accreditation (NBA) is one of the two major bodies responsible for accreditation of higher education institutions in India, along with the National Assessment and Accreditation Council (NAAC).[1] NBA accredits technical programmes, such engineering and management programmes, while NAAC accredits general colleges and universities. NBA is a full member of the Washington Accord.

NBA was established by the All India Council for Technical Education (AICTE) in 1994 and operated as an autonomous body since 2010. In 2014 it was granted a full membership status in the Washington Accord.

National Council for Teacher Education (NCTE) is a statutory body of Indian government set up under the National Council for Teacher Education Act, 1993 in 1995 is to formally oversee standards, procedures and processes in the Indian education system NCTE forms an extremely critical structure of the Indian government's National Curriculum Framework for Teacher Education 2009, and has been the organisation that developed the year 2009 draft of the same framework.

As of 2007, the NCTE has its headquarters in New Delhi apart from regional representations in many other cities. Four official 'Regional Committees' of NCTE operate from Jaipur, Bangalore, Bhubaneswar and Bhopal handling the Northern, Southern, Eastern and Western regions respectively. The councils are responsible for recognizing 'teacher training institutions'.

VALUE EDUCATION:

Value-education is the aggregate of all the process by means of which a person develops abilities, attitudes and other forms of behavior of the positive values in the society in which he lives.

Value-education, is concerned to make morality a living concern for students. Hence, what is needed is value-education. Despite many educators and educationists description regarding value-education, it cannot be denied that continuing research will continue to making the description of value- education more adequate.

Objectives for value-education may be taken up as follows:

1. Development of child's personality in its physical, mental, emotional and spiritual aspects,
2. Inculcation of good manners and of responsible and cooperative citizenship.
3. Developing respect for the dignity of individual and society.
4. Developing a democratic way of thinking and living.
5. Developing tolerance towards and understanding of different religious faiths.
6. Developing sense of brotherhood at social, national and international levels.
7. Suggesting measures for better utilization of value-education.
8. Finding out the interests of pupils in relation to different aspects and activities of value-education.

Value Based Environmental Education:

1. Human Values: Preparation of text-books and resource materials about environmental education can play an important role in building positive attitudes about environment. The basic human value 'man in nature' rather than 'nature for man' needs to be infused through the same.

2. Social Values: Love, compassion, tolerance and justice which are the basic teachings of most of our religions need to be woven into environmental education. These are the values to be nurtured so that all forms of life and the biodiversity on this earth are protected.

3. Cultural and Religious Values: Our cultural customs and rituals in many ways teach us to perform such functions as would protect and nurture nature and respect every aspect of nature, treating them as sacred, are it rivers, earth, mountains or forests.

4. Ethical Values: The educational system should promote the earth-citizenship thinking. Instead of considering human being as supreme we have to think of the welfare of the earth.

5. Global Values: The concept that the human civilization is a part of the planet as a whole and similarly nature and various natural phenomena over the earth are interconnected and inter-linked with special bonds of harmony. If we disturb this harmony anywhere there will be an ecological imbalance leading to catastrophic results.

6. Spiritual Values: Principles of self-restraint, self-discipline, contentment, reduction of wants, freedom from greed and austerity are some of the finest elements intricately woven into the traditional and religious fabric of our country. All these values promote conservationism and transform our consumerist approach.

Dr. M. T. Ramji, in his book entitled as '**VALUE ORIENTED SCHOOL EDUCATION**' has mentioned that in the context of modern India which is moving towards industrialization and technology, we need education that is based on spiritual, moral and social values.

ENVIRONMENTAL EDUCATION

International Union for the Conservation of Nature (IUCN; 1971) "... the process of recognizing values and clarifying concepts in order to develop skills and attitudes necessary to understand and appreciate the interrelatedness among men, his culture and his biophysical surroundings. EE also entails practice in decision-making and self-formulation of a code of behavior about issues concerning environmental quality.

Environmental education (EE) refers to organized efforts to teach how natural environments function, and particularly, how human beings can manage behavior and ecosystems to live sustainably. It is a multi-disciplinary field integrating disciplines such as biology, chemistry, physics, ecology, earth science, atmospheric science, mathematics, and geography. The term implies education within the school system, from primary to post-secondary.

NEED FOR THE ENVIRONMENTAL EDUCATION

- Some form of environmental pollution affects each and every nation though the issues differ
- Some of the most urgent environmental threats to be dealt with now and in the future
- Educational institutions all over the world have been making intense efforts to meet the challenges arising from politics, science and public opinion towards integrating environmental concerns.

Programme with the following aspects:

- ❖ Goals, concepts and components of the specific educational measures
- ❖ Relationship between environmental crises and environmental education
- ❖ Subjects and actors – teachers and pupils and the qualifications
- ❖ Target groups
- ❖ Local environment
- ❖ Educational Institutions
- ❖ Conditions and access and participation

IMPORTANCE (SIGNIFICANCE) OF ENVIRONMENTAL EDUCATION

- ❖ Essential for the self-fulfillment and social development of the child and the adult.
- ❖ Essential for understanding the different food chains and the nature's ecological balance.
- ❖ Plays an important role in understanding and appreciating how the environment is used for making a living and promoting material culture.
- ❖ Enables one to appreciate and enjoy nature and society.
- ❖ Inculcates a concern for the systematic change of environment for the distant and immediate welfare of mankind.
- ❖ Makes one conscious of the problems of population explosion, depletion of natural resources, global warming, etc.

Role of Teacher in Meeting the Challenges of Air Pollution

- ❖ World-wide campaign – about smoking
- ❖ Use of good quality of automobile fuels
- ❖ Planting trees – Afforestation
- ❖ Air pollution – checking by cyclone collectors, electrostatic precipitators etc
- ❖ Motor vehicles – sulphur free and lead free fuel
- ❖ Non-combustible sources of energy – developed
- ❖ Factories chimneys – tall
- ❖ Using air filters
- ❖ Awareness programmes

Role of Teacher in Meeting the Challenges of Water Pollution

- ❖ Waste water – treated before its discharge into lake or river
- ❖ Proper filtering mechanism
- ❖ Use of herbicide and pesticide – minimized
- ❖ Pollutants removed by suitable methods – absorption, electro dialysis, ion exchange, reverse osmosis
- ❖ Industrial effluents and thermal pollutants – reutilized
- ❖ Urban waste – reused to generate cheaper fuel gas and electricity
- ❖ Biological and physical methods – restore species diversity and to maintain ecological balance in the water bodies.

Role of Teacher in Meeting the Challenges of Land Pollution

- ❖ Agronomic Methods – Contour planting, Contour furrowing, Contour cropping, Mulchig and Ley farming
- ❖ Construction of dams
- ❖ Controlled grazing
- ❖ Soil fertility
- ❖ Forest management
- ❖ Use of bio fertilizers and natural manures
- ❖ Wind breaks and wind – shield
- ❖ Special pits – dumping industrial waste
- ❖ Afforestation – barren areas
- ❖ Recycling and recovery of materials – agricultural wastes, paper, plastics and glass
- ❖ Public awareness programmes
- ❖ Proper control methods

Role of Teacher in Meeting the Challenges of Noise Pollution

- ❖ Gadgets – developed
- ❖ Ear muffs – industrial workers and traffic control personnel
- ❖ Noise section of the factory – located far away
- ❖ Room walls – sound absorbers
- ❖ Loud speakers – avoided
- ❖ Planting trees

Education for Girls

❖ Beti Bachao Beti Padhao Abhiyan

The Department of School Education and Literacy has supported the Ministry of Women and Child Development for roll out of “Beti Bachao Beti Padhao” Abhiyan in 100 districts of the country to enhance the sex ratio and the status of the girl child. An award is being instituted from the “Beti Bachao Beti Padhao” Abhiyan for School Management Committees which achieve 100% transition of girls at different levels of education.

❖ Swachh Vidyalaya

The Department is committed to the provision of a functional girls toilet in every school. A specific “Swachh Vidyalaya” campaign has been rolled out which will ensure that a functional toilet is available in every school before 15th August 2015.

❖ UDAAN

UDAAN is an initiative of the Central Board of Secondary Education (CBSE) to enable disadvantaged girl students and other students from SC/ST & minorities to transit from school to post-school professional education especially in Science and Math. The first flight of UDAAN is to address lower enrolment of girls in engineering colleges which is currently about 23% girls as against 77% of boys.

It aims to reduce the quality gap between school education and engineering education entrance systems by focusing on the three dimensions-curriculum design, transaction and assessment. It will do this by enriching and supplementing teaching and learning of Science and Mathematics at Senior Secondary level. The CBSE will provide free and online resources to the entire student population with special incentives and support to a thousand selected is advantaged girls per year.

❖ **Swami Vivekananda Single Girl Child Scholarship for Research in Social Sciences**

UGC has formulated this scheme under which 300 scholars would be provided Junior Research Fellowship @ Rs. 8,000/--10,000/- per month, and will be implemented from academic year 2014-15.

❖ **PRAGATI**

Providing Assistance for Girls' Advancement in Technical Education Initiative.

The AICTE scheme envisages selection of one girl per family where family income is less than 6 lakhs / annum on merit at the qualifying examination to pursue technical education. The scheme is to be implemented by the authorized admission center of respective State Governments. 4000 girls are expected to benefit of scholarships available per annum. The scholarship amount is Rs. 30,000 or tuition fees or actual whichever is less and Rs. 2000/ month for ten months as contingency allowance.

Persons with Special Needs

❖ **SAKSHAM**

Scholarship for Differently-abled children AICTE has decided to award 1000 scholarships per annum to differently abled students to pursue technical education based on merit in the qualifying examination to pursue technical education. The scholarship amount would be Rs. 30000 or tuition fees or actual whichever is less and Rs. 2000 / month for ten months as contingency allowance.

❖ **Ishan Uday**

Special Scholarship Scheme for students of North East Region. The UGC has launched a special scholarship Scheme for students of North East Region from the academic session 2014-15. The Scheme envisages grant of 10,000 scholarships to students from North East Region whose parental income is below Rs. 4.5 lakh per annum and would be provided scholarship ranging from Rs. 3,500 to 5,000 per month for studying at under graduate level in Colleges/Universities of the country.

❖ **Ishān Vikās**

Ishān Vikās is a comprehensive plan to bring selected students from the school and college e levels from the North-Eastern states into close contact with the IITs, NITs and IISERs during their vacation periods. A typical visit is envisaged for a period of ten days to one of these institutions, in the form of either an exposure or an Internship programme. Each school will send one teacher to accompany a group of about 32 students of class IX and X and 8 teachers. The college students would be organized in two groups in summer and in winter, consisting of 32 students each group. About 2016 college students and 504 teachers from N-E will be visiting premier Institutes, like IIT/NIT/ IISERs in an academic year. or Centrally Funded Technological Institutes) with Stipends and Travel will be taken up. From 25 Institutions, about 250 students will be visiting 16 IITs and 6 NITs (to start with six NITs are being considered) per year.

❖ **ICT enabled enhancement of learning opportunities**

ICT enabled enhancement of learning opportunities to accelerate outreach, improve quality and promote equity by facilitating access to the best educational resources for learners/ teachers.

❖ SWAYAM (Study Webs of Active –Learning for Young Aspiring Minds) PROGRAMME:

Under this programme, Professors of centrally funded institutions like IITs, IIMs, Centrally universities will offer online courses to citizens of our country. All courses will be made available free of cost for learning. In case the learner requires a Verified Certificate, a small fee will be applicable.

In first phase, IIT Bombay, IIT Chennai, IIT Kanpur, IIT Guwahati, University of Delhi, Jawahar Lal Nehru University, IGNOU, IIM Bangalore, IIM Calcutta, Banaras Hindu University, alone as well as with the help of faculty from foreign universities will be offering courses in areas of engineering education, social science, energy, management, basic sciences. At least one crore students are expected to benefit in 2 to 3 years through this initiative. **SWAYAM** will be launched in 2014.

❖ National E-Library

The E-Library has been envisaged as an online portal that will democratize access to knowledge by ensuring that quality content from central universities and premier educational institutions are available in a digital format that can be easily accessed by students, working professionals and researchers across the country through laptops, smartphones, tablets, PC's. International collaboration has been offered by Israel, Norway, UK, UNESCO. The National E –Library becomes operational in the academic year 2015.

Augmenting Research

❖ Dr. S. Radhakrishnan Post Doctoral Fellows in Social Sciences

The UGC has launched a new scheme, Dr. S. Radhakrishnan Post-Doctoral Fellows in Social Sciences including Languages. Under the scheme 300 fellowships would be awarded at the rate of Rs. 25,000 per month + HRA etc. for a period of 3 years to the selected Fellows.

❖ AICTE Scholarship for Ph D Studies

AICTE has announced 1000 scholarships per annum to eligible candidates to pursue PhD in CSIR / DRDO labs or other reputed institutions: Payment of scholarship is as per the Government norms for the purpose.

❖ Quality Improvement Program (QIP)

This is a program conducted by GOI to promote research amongst the eligible teachers in AICTE approved Institutions and others and facilitate them to complete a Ph D from the best Institutions in India like the IIT's and NIT's or other Nationally important Institutes. This scheme is open only to regular teachers. It is proposed to offer ME/M.Tech Scholarships under QIP to 7500 scholarships for M Tech under QIP and 2500 Scholarships for PhD under QIP.

Historical background of Indian Constitution

Regulating Act of 1773

The **first step** was taken by the **British Parliament** to control and regulate the affairs of the East India Company in India. It designated the **Governor of Bengal** (Fort William) as the **Governor-General** (of Bengal). Warren Hastings became the **first Governor-General of Bengal**. Executive Council of the Governor-General was established (**Four members**). There was no separate **legislative council**. It subordinated the Governors of **Bombay and Madras** to the Governor-General of Bengal. The **Supreme Court** was established at Fort William (Calcutta) as the Apex Court in **1774**. It prohibited servants of the company from engaging in any private trade or accepting bribes from the natives. Court of Directors (the governing body of the company) should report its revenue.

Pitt's India Act of 1784

- ❖ Distinguished between commercial and political functions of the company.
- ❖ Court of Directors for Commercial functions and Board of Control for political affairs.
- ❖ Reduced the strength of the Governor General's council to three members.
- ❖ Placed the Indian affairs under the direct control of the British Government.
- ❖ The companies territories in India were called "the British possession in India".
- ❖ Governor's councils were established in Madras and Bombay.

Charter Act of 1813

- ❖ The Company's monopoly over Indian trade terminated; Trade with India open to all British subjects.
- ❖ Charter Act of 1833
- ❖ Governor-General (of Bengal) became as the Governor-General of India.
- ❖ First Governor-General of India was Lord William Bentick.
- ❖ This was the final step towards centralization in the British India.
- ❖ Beginning of a Central legislature for India as the act also took away legislative powers of Bombay and Madras provinces.
- ❖ The Act ended the activities of the East India Company as a commercial body and it became a purely administrative body.

Charter Act of 1853

- ❖ The legislative and executive functions of the Governor-General's Council were separated.
- ❖ 6 members in Central legislative council. Four out of six members were appointed by the provisional governments of Madras, Bombay, Bengal and Agra.
- ❖ It introduced a system of open competition as the basis for the recruitment of civil servants of the Company (Indian Civil Service opened for all).

Government of India Act of 1858

- ❖ The rule of Company was replaced by the rule of the Crown in India.
- ❖ The powers of the British Crown were to be exercised by the Secretary of State for India
- ❖ He was assisted by the Council of India, having 15 members
- ❖ He was vested with complete authority and control over the Indian administration through the Viceroy as his agent
- ❖ The Governor-General was made the Viceroy of India.
- ❖ Lord Canning was the first Viceroy of India.
- ❖ Abolished Board of Control and Court of Directors.

Government of India Act of 1919

- ❖ This Act is also known as the Montague-Chelmsford Reforms.
- ❖ The Central subjects were demarcated and separated from those of the Provincial subjects.
- ❖ The scheme of dual governance, 'Dyarchy', was introduced in the Provincial subjects.
- ❖ Under dyarchy system, the provincial subjects were divided into two parts – transferred and reserved. On reserved subjects, Governor was not responsible to the Legislative council.
- ❖ The Act introduced, for the first time, bicameralism at center.
- ❖ Legislative Assembly with 140 members and Legislative council with 60 members.
- ❖ Direct elections.
- ❖ The Act also required that the three of the six members of the Viceroy's Executive Council (other than Commander-in-Chief) were to be Indians.
- ❖ Provided for the establishment of Public Service Commission.

Government of India Act of 1935

- ❖ The Act provided for the establishment of an All-India Federation consisting of the Provinces and the Princely States as units, though the envisaged federation never came into being.
- ❖ **Three Lists:** The Act divided the powers between the Centre and the units into items of three lists, namely the Federal List, the Provincial List and the Concurrent List.
- ❖ The Federal List for the Centre consisted of 59 items, the Provincial List for the provinces consisted of 54 items and the Concurrent List for both consisted of 36 items
- ❖ The residuary powers were vested with the Governor-General.
- ❖ The Act abolished the Dyarchy in the Provinces and introduced 'Provincial Autonomy'.
- ❖ It provided for the adoption of Dyarchy at the Centre.
- ❖ Introduced bicameralism in 6 out of 11 Provinces.
- ❖ These six Provinces were Assam, Bengal, Bombay, Bihar, Madras and the United Province.
- ❖ Provided for the establishment of Federal Court.
- ❖ Abolished the Council of India.

Indian Independence Act of 1947

- ❖ It declared India as an Independent and Sovereign State.
- ❖ Established responsible Governments at both the Centre and the Provinces.
- ❖ Designated the Viceroy India and the provincial Governors as the Constitutional (normal heads).
- ❖ It assigned dual functions (Constituent and Legislative) to the Constituent Assembly and declared this dominion legislature as a sovereign body.

Points to be noted constitution of india

- ❖ Laws made before Charter Act of 1833 were called Regulations and those made after are called Acts.
- ❖ Lord Warren Hastings created the office of District Collector in 1772, but judicial powers were separated from District collector later by Cornwallis.
- ❖ From the powerful authorities of unchecked executives, the Indian administration developed into a responsible government answerable to the legislature and people.
- ❖ The development of portfolio system and budget points to the separation of power.
- ❖ Lord Mayo's resolution on financial decentralization visualized the development of local self-government institutions in India (1870).
- ❖ **1882:** Lord Ripon's resolution was hailed as the 'Magna Carta' of local self-government. He is regarded as the 'Father of local self-government in India'.
- ❖ **1921:** Railway Budget was separated from the General Budget.
- ❖ From 1773 to 1858, the British tried for the centralization of power. It was from the 1861 Councils act they shifted towards devolution of power with provinces.
- ❖ 1833 Charter act was the most important act before the act of 1909.
- ❖ Till 1947, the Government of India functioned under the provisions of the 1919 Act only. The provisions of 1935 Act relating to Federation and Dyarchy were never implemented.
- ❖ The Executive Council provided by the 1919 Act continued to advise the Viceroy till 1947. The modern executive (Council of Ministers) owes its legacy to the executive council.
- ❖ The Legislative Council and Assembly developed into Rajyasabha and Lok Sabha after independence.

PREAMBLE

WE, THE PEOPLE OF INDIA, having solemnly resolved to constitute India into a **SOVEREIGN, SOCIALIST, SECULAR, DEMOCRATIC, REPUBLIC** and to secure to all its citizens:
JUSTICE, social, economic and political; constitution of india
LIBERTY of thought, expression, belief, faith and worship;
EQUALITY of status and of opportunity; and to promote among them all

FRATERNITY assuring the dignity of the individual and the unity and integrity of the nation;
IN OUR CONSTITUENT ASSEMBLY this twenty-sixth day of November 1949, do **HEREBY ADOPT,**
ENACT AND GIVE TO OURSELVES THIS CONSTITUTION.

PART I: THE UNION AND ITS TERRITORY

1. Name and territory of the Union.
2. Admission or establishment of new States.
2A [Repealed.]
3. Formation of new States and alteration of areas, boundaries or names of existing States.
4. Laws made under articles 2 and 3 to provide for the amendment of the First and the Fourth Schedules and supplemental, incidental and consequential matters.

PART II: CITIZENSHIP

5. Citizenship at the commencement of the Constitution.
6. Rights of citizenship of certain persons who have migrated to India from Pakistan.
7. Rights of citizenship of certain migrants to Pakistan.
8. Rights of citizenship of certain persons of Indian origin residing outside India.
9. Persons voluntarily acquiring citizenship of a foreign State not to be citizens.
10. Continuance of the rights of citizenship.
11. Parliament to regulate the right of citizenship by law.

PART III : FUNDAMENTAL RIGHTS

General

12. Definition.
13. Laws inconsistent with or in derogation of the fundamental rights.

Right to Equality

14. Equality before law.
15. Prohibition of discrimination on grounds of religion, race, caste, sex or place of birth.
16. Equality of opportunity in matters of public employment.
17. Abolition of Untouchability.
18. Abolition of titles.

Right to Freedom

19. Protection of certain rights regarding freedom of speech, etc.
20. Protection in respect of conviction for offences.
21. Protection of life and personal liberty.
22. Protection against arrest and detention in certain cases.

Right against Exploitation

23. Prohibition of traffic in human beings and forced labour.
24. Prohibition of employment of children in factories, etc.

Right to Freedom of Religion

25. Freedom of conscience and free profession, practice and propagation of religion.
26. Freedom to manage religious affairs.
27. Freedom as to payment of taxes for promotion of any particular religion.
28. Freedom as to attendance at religious instruction or religious worship in certain educational institutions.

Cultural and Educational Rights

- 29. Protection of interests of minorities.
- 30. Right of minorities to establish and administer educational institutions.
- 31. [Repealed.]

Saving of Certain Laws

- 31A. Saving of Laws providing for acquisition of estates, etc.
- 31B. Validation of certain Acts and Regulations.
- 31C. Saving of laws giving effect to certain directive principles.
- 31D. [Repealed.]

Right to Constitutional Remedies

- 32. Remedies for enforcement of rights conferred by this Part.
- 32A. [Repealed.]
- 33. Power of Parliament to modify the rights conferred by this Part in their application to Forces, etc.
- 34. Restriction on rights conferred by this Part while martial law is in force in any area.
- 35. Legislation to give effect to the provisions of this Part.

PART IV : DIRECTIVE PRINCIPLES OF STATE POLICY

- 36. Definition.
- 37. Application of the principles contained in this Part.
- 38. State to secure a social order for the promotion of welfare of the people.
- 39. Certain principles of policy to be followed by the State.
- 39A. Equal justice and free legal aid.
- 40. Organisation of village panchayats.
- 41. Right to work, to education and to public assistance in certain cases.
- 42. Provision for just and humane conditions of work and maternity relief.
- 43. Living wage, etc., for workers.
- 43A Participation of workers in management of industries.
- 44. Uniform civil code for the citizens.
- 45. Provision for free and compulsory education for children.
- 46. Promotion of educational and economic interests of Scheduled Castes, Scheduled Tribes and other weaker sections.
- 47. Duty of the State to raise the level of nutrition and the standard of living and to improve public health.
- 48. Organization of agriculture and animal husbandry.
- 48A Protection and improvement of environment and safeguarding of forests and wild life.
- 49. Protection of monuments and places and objects of national importance.
- 50. Separation of judiciary from executive.
- 51. Promotion of international peace and security.

PART IVA: FUNDAMENTAL DUTIES

- 51A Fundamental duties.

POINTS TO REMEMBER

- ❖ Constitution of India is the World's Longest written constitution of any sovereign Country in the world
- ❖ Constitution of India contains **448 Articles in 25 Parts, 12 Schedules** and **101 Amendments till date.**
- ❖ The Temporary Chairman of the first meeting of the Constituent Assembly held on **9 December 1946 is Sachchidananda Sinha**
- ❖ The Oldest constitution in the world known today is the constitution of United States of America
- ❖ The Idea of Indian Constitution was given by **Dr B R Ambedkar** who was the Chairman of the Draft Commission set up by the constituent assembly in **1947** to prepare the draft of the constitution.
- ❖ The Drafting Commission constituted a panel of **7 Members:-**
 - ✓ Krishnaswamy Ayyar
 - ✓ Gopalaswamy Ayyangar,
 - ✓ Alladi Saadullah
 - ✓ Madhava Rao (replaced B.L. Mitter),
 - ✓ T. Krishnamachari (replaced Dr. D.P. Khaitan after his Death)
 - ✓ M. Munshi
- ❖ The Constitution of India is adopted by the Constituent assembly on **26 November, 1949** and the **Constitution of India came into force on 26 January, 1950**
- ❖ The Cabinet Mission to India in **1946** headed by **Lord Pethick Lawrence** was aimed to discuss the transfer of power from the British government to the Indian leadership and granting it independence.
- ❖ The Constitution of India which was framed by the Constituent assembly which was set up in **1946 "Samvidhan Divas"** or constitution day is observed every year in India on 26 November to commemorate the adoption of constitution on 26 November 1949.
- ❖ Supreme Court acts as guardian of constitution by exercising Writs Jurisdiction, Appellate Jurisdiction and Power of Judicial Review
- ❖ Pingali Venkayya designed the present day National Flag and adopted during the constituent assembly meeting on 22 July 1947.
- ❖ Rajendra Prasad was the **President** of the Constituent Assembly.
- ❖ The two prominent female leaders who played a key role in the drafting of the constitution of India are **Dakshayani Velayudhan and Vijaya Lakshmi Pandit.**
- ❖ The President of India is called the First Citizen of India as per the Constitution of India
- ❖ The Committee on Fundamental Rights and Minority Rights of the Constituent Assembly was headed by Sardar Vallabhbhai Patel.
- ❖ For the first time in India, Indian Councils Act **1909** has legitimized the elections of Indians to the various legislative councils in India
- ❖ Government of India Act, 1935 has given the representation to Indians for the first time in Legislation
- ❖ The first session of the constituent assembly was held in the "Constitution Hall" – presently "The Central Hall of the Parliament House" in New Delhi on December 9 1946
- ❖ In June, 1948 – **Clement Attlee** the Prime Minister of England in 1948 announced the transfer of Power to Indians
- ❖ Preamble was called the **Soul of the Indian Constitution by Thakurdas Bhargav**
- ❖ Preamble to the Constitution of India is a brief introductory statement that sets out the guiding purpose and principles of the document is Proposed by Jawaharlal Nehru before the Drafting Committee of the Constitution on 13 December 1946
- ❖ **Preamble** was called the Political Horoscope of the Indian Constitution by **K M Munshi.**
- ❖ The strength of the constituent Assembly at the time of adoption of the constitution of India was 299

- ❖ The members of the constituent assembly were elected Indirectly by Legislatures of Provincial Assemblies and nominated by the rulers of the Princely states
- ❖ The Constituent Assembly itself became the Parliament of India.
- ❖ Government of India Act is the last constitution of the British India which lasted till 1947
- ❖ The First General Elections of Independent India were held in the Year 1952
- ❖ Beohar Rammanohar Sinha and Nandalal Bose are the one of the prominent Artists from Shantiniketan who had Hand Written the Constitution of India.
- ❖
- ❖ First President of Independent India **Dr Rajendra Prasad**
- ❖ First Prime Minister of Independent India **Jawaharlal Nehru**
- ❖ First Education Minister of Independent India **Maulana Abdul Kalam Azad**
- ❖ First Home of Independent India **Sardar Vallabhbhai Patel**
- ❖ First Foreign Minister of Independent India **Jawaharlal Nehru**
- ❖ First Commerce and Industry Minister of Independent India **Syama Prasad Mukherjee**
- ❖ First Finance Minister of Independent India **Shanmukham Chetty**
- ❖ First Health Minister of Independent India **Amrit Kaur**
- ❖ First Indian Governor General of Independent **C Rajagopalachari**
- ❖
- ❖ The British Monarch and president of India have the same constitutional authority.
- ❖ The Real Powers of the state in a Parliamentary form of Government lies with the Council of Ministers headed by the Prime Minister of the Country
- ❖ It took 2 Year 11 Months and 18 Days to Finalize the constitution from the date of Planning a Drafting Committee
- ❖ The Directive Principles of State Policy mentioned in the Indian Constitution are important Principles Government has to keep in mind while formulating a new policy
- ❖ The Parliament of India is a Bicameral Legislature with two legislatures: **Rajya Sabha and Lok Sabha**
- ✓ **Six States in India have Bicameral Legislatures, they are:**
 - ❖ Andhra Pradesh
 - ❖ Telangana
 - ❖ Bihar
 - ❖ Karnataka
 - ❖ Maharashtra
 - ❖ Uttar Pradesh
 - ❖ The two State Legislatures are Legislative Assembly and Legislative Council.
 - ❖ The Indian Constitution has been best described as the "Lawyer's Paradise" by the British Lawyer" **Ivor Jennings**"
 - ❖ Idea of Preamble has been borrowed by the Indian Constitution from the Constitution of USA.
 - ❖
 - ❖ J&K is now a union territory. Ladakh is also now a union territory.

Borrowed features of Indian Constitution are as follows;

Government of India Act of 1935

1. Federal Scheme
2. Office of governor
3. Judiciary
4. Public Service Commissions
5. Emergency provisions

6. Administrative details

Britain

1. Parliamentary government
2. Rule of Law
3. Legislative procedure
4. Single citizenship
5. Cabinet system
6. Prerogative writs
7. Parliamentary privileges
8. Bicameralism

Ireland

1. Directive Principles of State Policy
2. Nomination of members to Rajya Sabha
3. Method of election of president

Unites States of America

1. Impeachment of the president
2. Functions of president and vice-president
3. Removal of Supreme Court and High court judges
4. Fundamental Rights
5. Judicial review
6. Independence of judiciary
7. Preamble of the constitution

Canada

1. Federation with a strong Centre
2. Vesting of residuary powers in the Centre
3. Appointment of state governors by the Centre
4. Advisory jurisdiction of the Supreme Court

Australia

1. Concurrent List
2. Freedom of trade
3. Commerce and intercourse

4. Joint sitting of the two Houses of Parliament

Soviet Constitution (USSR, now Russia)

1. Fundamental duties
2. The ideal of justice (social, economic and political) in the Preamble

France

1. The ideals of Republic in the Preamble
2. The ideals of liberty in the Preamble
3. The ideals of equality in the Preamble
4. The ideals of fraternity in the Preamble

Weimar Constitution of Germany

1. Suspension of Fundamental Rights during Emergency

South African Constitution

1. Procedure for amendment of the Constitution
2. Election of members of Rajya Sabha

Japan

1. Concept of “procedure established by Law”

IMPORTANT ARTICLES OF THE INDIAN CONSTITUTION

- ❖ ARTICLE 14 EQUALITY BEFORE LAW
- ❖ ARTICLE 17 ABOLITION OF UNTOUCHABILITY
- ❖ ARTICLE 21 PROTECTION OF LIFE AND PERSONAL LIBERTY
- ❖ ARTICLE 21A RIGHT TO EDUCATION
- ❖ ARTICLE 23 PROHIBITION OF TRAFFIC IN HUMAN BEINGS AND FORCED LABOUR
- ❖ ARTICLE 44 UNIFORM CIVIL CODE FOR ALL CITIZENS
- ❖ ARTICLE 48A Protection and improvement of environment and safeguarding of forests and wild life
- ❖ ARTICLE 50 SEPERATION OF JUDICIARY FROM EXECUTIVE
- ❖ ARTICLE 51 PROMOTION OF INTERNATIONAL PEACE AND SECURITY
- ❖ ARTICLE 51 ELECTION OF PRESIDENT
- ❖ ARTICLE 66 ELECTION OF VICE- PRESIDENT
- ❖ ARTICLE 72 Power of President to grant pardons, etc. and to suspend, remit or commute sentences in certain cases
- ❖ ARTICLE 74 COUNCIL OF MINISTERS TO AID AND ADVISE THE PRESIDENT
- ❖ ARTICLE 76 ATTORNEY GENERAL OF INDIA
- ❖ ARTICLE 79 CONSTITUTION OF PARLIAMENT
- ❖ ARTICLE 80 RAJYA SABHA-COMPOSITION OF THE COUNCIL OF STATES
- ❖ ARTICLE 81 LOKSABHA-COMPOSITION OF HOUSE OF PEOPLE
- ❖ ARTICLE 124 ESTABLISHMENT AND CONSTITUTION OF SUPREME COURT OF INDIA
- ❖ ARTICLE 300A RIGHT TO PROPERTY
- ❖ ARTICLE 315 PUBLIC SERVICE COMMISSIONS FOR THE UNION AND THE STATES THE VOTING AGE OF THE ELECTORATE WAS REDUCED FROM 21 YEARS TO 18 YEARS BY THE 61 CONSTITUTIONAL AMENDMENT IN 1988

❖ RIGHT TO EDUCATION OF CHILDREN FROM THE AGE OF 6 YEARS TO 14 YEARS WAS MADE A FUNDAMENTAL RIGHT BY THE 86 AMENDMENT IN 2002.

- ✓ The Attorney General of India is the **first Law Officer** of the Government of India who gives advice on legal matters and performs other duties of a legal character as assigned to him by the President
- ✓ Attorney General of India is mentioned in **Article 76** of the Constitution of India
- ✓ The **Solicitor General of India** is below the Attorney General for India, who is the Indian government's chief legal advisor, and its primary lawyer in the Supreme Court of India. The Solicitor General of India is appointed for the period of 3 year
- ✓ The Post of Solicitor General is not mentioned in the constitution of India and is merely statutory.
- ✓ President is the head of both the Houses in India – **Rajya Sabha and Lok Sabha**
- ✓ The **Rajya Sabha** is the upper house of the Parliament of India.
- ✓ The members **Rajya Sabha** are elected by the members of Legislative Assembly of respective states
- ✓ The **Vice- President** of India is the ex-officio of Chairman of **Rajya Sabha**
- ✓ The maximum Strength of the of **Rajya Sabha** is limited by the Constitution under **Article 79** to a maximum of **250 members**
- ✓ Lok Sabha is the Lower house of India's bicameral Parliament under Article 79 of the Indian Constitution of India
- ✓ Maximum strength of the Loksabha is 545 (543 elected + 2 Nominated from the AngloIndian Community by the President)
- ✓ The Supreme Court of India is the highest judicial forum and final court of appeal under the Constitution of India, the highest constitutional court, with the power of constitutional review mentioned, the strength of the Supreme Court of India is 31 (Chief Justice of India and 30 Judges.
- ✓ The First Rajya Sabha MP to become the Prime Minister of the country was Indira Gandhi
- ✓ Advocate General appointed by the Governor of the state is the highest law officer of the State.

The Chairman of the Union Public Service Commission is appointed by the President of India.